THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXX. No. 744.] LONDON, AUGUST 14, 1877. [29TH YEAR.] Price 6d.

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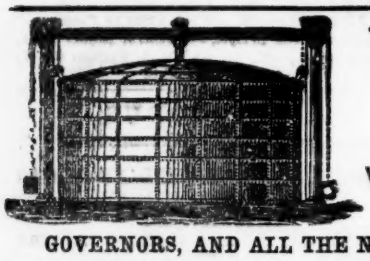

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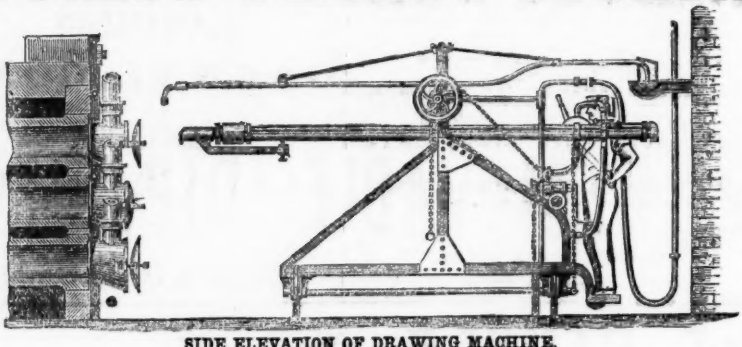
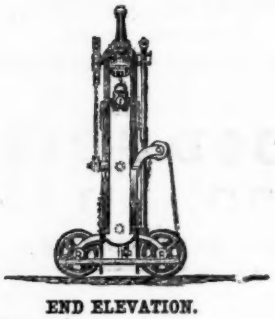


SIDE ELEVATION OF DRAWING MACHINE.



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(The Charging Machine will be Illustrated in next week's Advertisement.)

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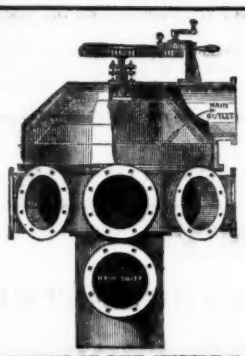

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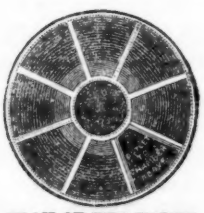

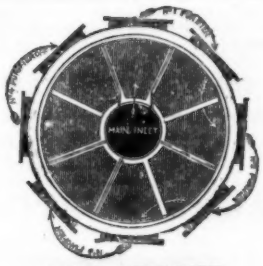

ELEVATION OF THE CENTRE-VALVE. PLAN OF THE VALVE. PLAN OF THE BODY.

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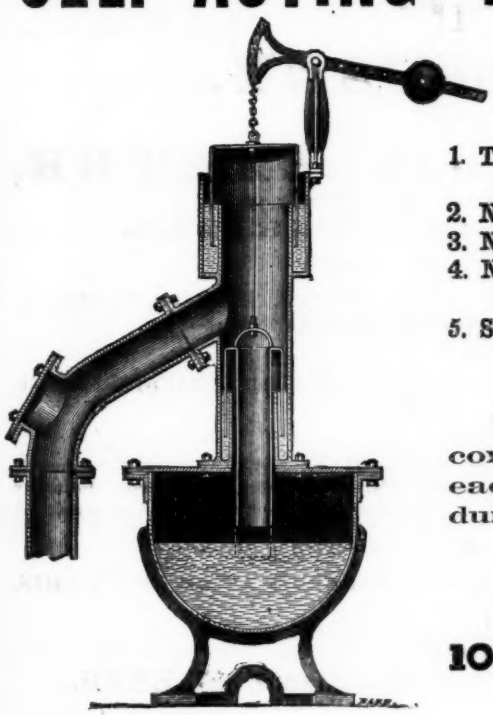

ADVANTAGES.

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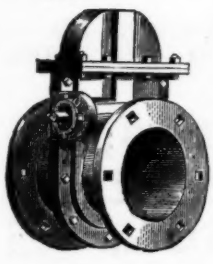

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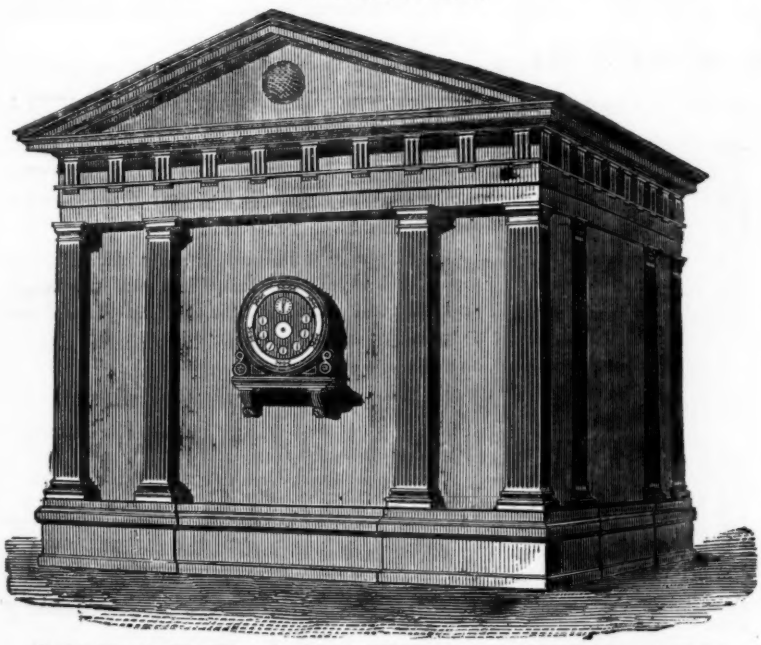

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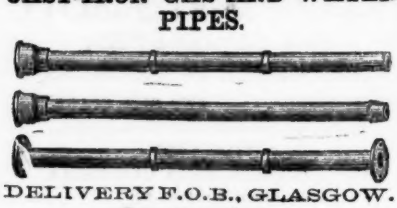
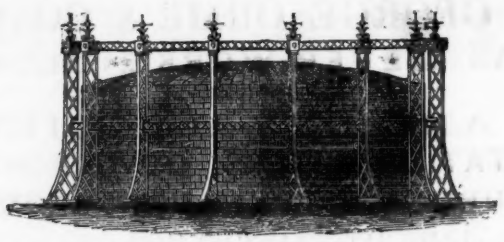
BEST STOURBRIDGE FIRE-BRICKS, LUMPS, AND CLAY RETORTS
Of all Dimensions for Gas-Works,
GLASS-HOUSE POTS & CRUCIBLES
Of every kind.
The Highest Award was obtained by H. & M., at the Philadelphia Exhibition, 1876, for Superior Quality of Manufacture.

"SELLARS' CEMENT"
PREVENTS WASTE OF GAS FROM RETORTS;
SAVES CLAY RETORTS FROM DESTRUCTION BY FIRE;
GREATLY ECONOMIZES THE USE OF FIRE-BRICKS;
And PREVENTS ALL POSSIBLE LOSS of GAS FROM LEAKAGE.
J. C. SELLARS,
THE GAS CEMENT WORKS,
BIRKENHEAD.

GAS AND WATER PIPES.
WILLIAM MACLEOD & CO.,
23 & 25, OSWALD STREET, GLASGOW.
CAST-IRON GAS AND WATER PIPES.



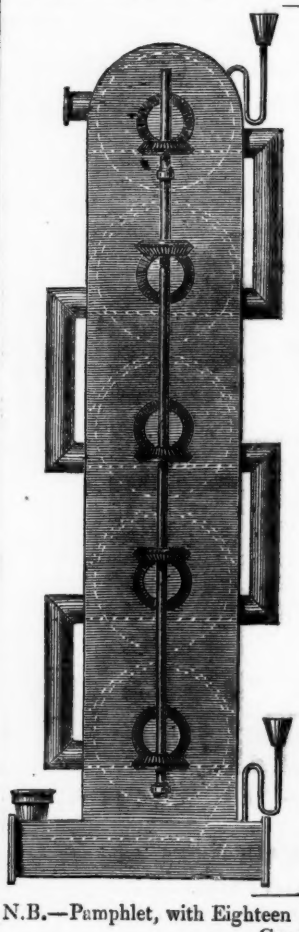
DELIVERY F.O.B., GLASGOW.
Prices on application.



THE HORSELEY COMPANY,
LIMITED,
TIPTON, STAFFORDSHIRE.
LONDON OFFICE:
6, WESTMINSTER CHAMBERS, VICTORIA STREET,
GAS ENGINEERS, IRONFOUNDERS, &c.,
MANUFACTURERS OF
GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,
AND ALL REQUISITES FOR EITHER
GAS OR WATER WORKS;
ALSO
MAKERS OF ROOFS, BRIDGES, &c.

GEORGE ANDERSON,
GAS AND CONSULTING ENGINEER,
35A, GREAT GEORGE STREET,
WESTMINSTER, S.W.

ANDERSON'S
PATENT
COMBINED WASHER AND SCRUBBER.



TESTIMONY OF ITS ACTION.

The Gas-Works, St. Albans, April 27, 1877.

DEAR SIR,

Your Brush Scrubber has been in action here for four months.

It removes the whole of the ammonia from the gas, so that it will not discolour moistened turmeric paper.

The brushes cause no appreciable increase of pressure, and there is no repumping of liquor. Clear water run in at top, issues from the bottom fit to proceed to the sulphate-house.

It performs its work more efficiently than the tower scrubber I have, while only about half the height, and not one-fourth its weight or capacity.

My purifiers also last much longer before they are foul than they did previously.

I am, yours truly,
A. F. PHILLIPS.

G. Anderson, Esq.,
35*a*, Great George Street, S.W.

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

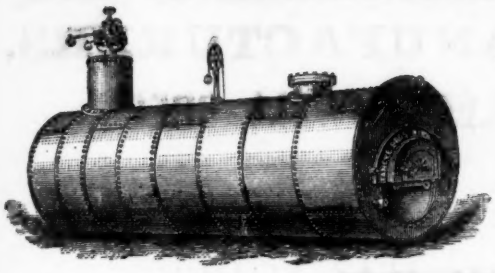
STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Eighteen Illustrations and Letterpress on the Construction of Gas-Works, post free, 2s. 6d.

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

STEAM-BOILERS,



CORNISH,

LANCASHIRE,

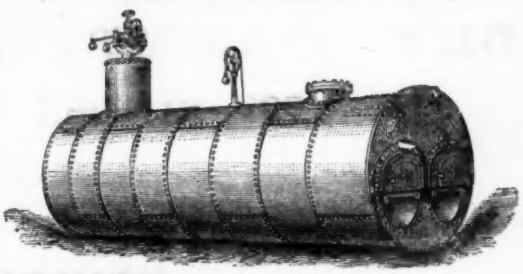
EGG-ENDED AND VERTICAL,

IN ALL SIZES,

AND OF

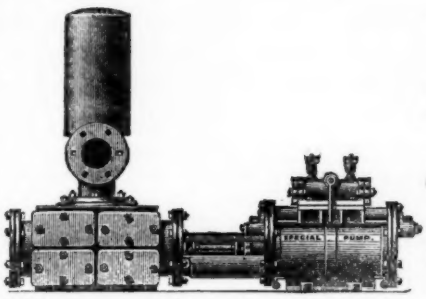
SUPERIOR QUALITY.

Prices on Application.



THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



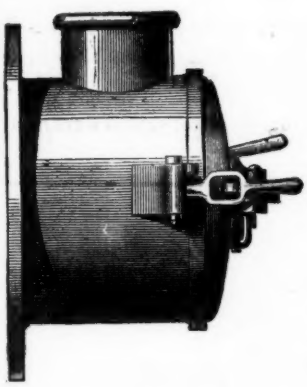
In use in 100 Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Several hundred "Special" Steam-Pumps are in successful operation, feeding Steam-Boilers.

200 Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.



MORTON'S

Patent Self-Sealing

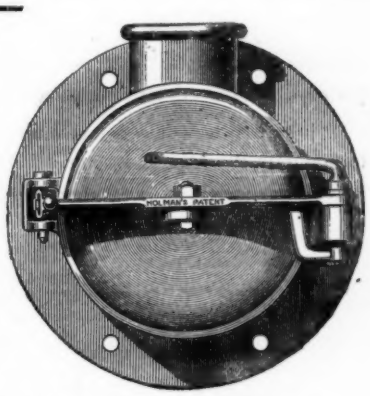
RETORT LIDS,

WITH

HOLMAN'S NEW PATENT BRACKETED CROSS-BARS, ANTI-FRICTION CATCHES, AND ECCENTRIC FASTENINGS.

Instantaneous Sealing effected. No Luting. No Duplicate Lids required. Holman's New Self-Sustaining Cross-Bar ensures freedom of joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested (rigid cast iron is now successfully employed), being now in use in nearly all the principal Gas-Works in London and the Provinces.



IMPORTANT TESTIMONIAL.

The Gaslight and Coke Company (commonly called the Chartered Gas Company), Beckton, North Woolwich.

Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them. I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly, (Signed) G. C. TREWBY.

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dronfield, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Sheffield, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION TO

TANGYE BROTHERS & HOLMAN,

SOLE MANUFACTURERS,

LAURENCE POUNTNEY LANE, LONDON, E.C.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

TO GAS ENGINEERS AND MANAGERS.

It having come to our knowledge that a report is in circulation, spread by some unprincipled person or persons, nat the cases of our larger-sized Meters are made of Galvanized Iron, we think it only fair to ourselves, and just to our customers, to say, that we never have used, in making any of our Meters, a single pound of *Galvanized Iron*, or any other *cheap* and *inferior material*, and this can be easily seen by opening any of them.

The cases of our large-sized Meters, from 20 lights and upwards, are all made of the very *Best Best Patent Alloy*, which is nearly double the price, and will last more than double the time, of some other material that has been and still is very largely used for the same purpose. And our experience, acquired by an extensive use of it for upwards of 30 years, enables us to say with confidence that no other metal in use for the purpose is so little liable to corrosion from the action of the gas.

We have now in use a Meter made in 1848, and therefore 29 years old, the case of which is made of Patent Alloy; the Meter is still in perfect order, and shows no signs of decay.

The utmost care is exercised by us in selecting none but the very best materials for all parts of our Meters; much of it is made *expressly for us*, as it is not possible to obtain it in the open market of the same superior quality.

The great fall in the price of all materials used in making our Meters has enabled us to give an increased discount, thus giving our customers the benefit of the fall. This we were bound in fairness to do, as we raised the price of our Meters four years ago, when the price of all metals went up.

It will be our constant endeavour, by using none but the best materials, and employing the most skilful workmen, to maintain the high character our Meter has hitherto borne.

WILLIAM PARKINSON & CO.

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF PATENT

WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 14, 1877.

Circular to Gas Companies.

It is gratifying to find, from the reports of the half-yearly meetings which we publish to-day, and from several others we have received, that Gas Companies are almost universally in a state of prosperity. The single drawback, in the case of some, is the diminished sale and low price of coke. Gas is consumed in an ever-increasing quantity; but it would appear that the consumption of coke does not progress at an equal rate. With, however, a revival of manufacturing industry, which we hope has already commenced, this branch of our business is certain to improve.

The meeting of the York United Gaslight Company will be found reported in another column, and it affords most satisfactory evidence of the continued prosperity of the Company. The low price at which the Company now sell their gas—2s. 6d. per 1000 feet—is telling greatly on the consumption, as a low price does everywhere. We are almost disposed to regret that the Company will have to apply next session for authority to increase their capital, because this will involve the infliction of the most recent legislation. Probably, however, in no case could this legislation be less prejudicial to the interest of a Company than in that of the York United. It will depend, however, upon the standard or initial price fixed with the sliding scale. If the present maximum be continued, the Directors will immediately be in a position to pay an increased dividend, and the shares sold by auction will realize high premiums.

The report of the meeting of the Cambridge University and Town Gaslight Company was crowded out last week, but we are able to publish it to-day, and once more call attention to the interesting speech of the Chairman. The Company are, of course, prosperous, and the learned Chairman can continue to rejoice over a ten per cent. dividend, to which he rightly considers all Gas Companies entitled. Dr. Phelps has, we know, rendered an essential service to all Gas Companies by his stout contention for their rights in this matter.

There is a prospect of another parliamentary fight over gas affairs in the City of Limerick. On the occasion of the third reading of the United General Gas Company's Bill in the Lords last Tuesday, a petition from certain inhabitants was presented, praying that no clause authorizing the purchase of the Company's undertaking by the Corporation should be inserted. The clause empowering the Corporation to purchase by agreement was thereupon struck out, and Earl Redesdale proposed an amendment, requiring the Corporation to bring in a Bill in case of an arrangement between them and the Company for the purchase of the works. The Corporation do not enjoy the full confidence of the inhabitants of the city, and perhaps are not entitled to it; but they will, no doubt, promote a Bill next session, which, we may assume, will be contested.

A committee of the Leicester Town Council have been appointed to confer with the Directors of the Gas Company with respect to the steps to be taken for the urgently necessary extensions of works, pending, we suppose, the transfer of the undertaking.

The Corporation of Droitwich seem to be in a peculiar position. They have become the purchasers of the gas-works, which require immediate extension; but they have not the money to pay for the undertaking, and are not likely to obtain power to raise it for some time to come. Under these circumstances they are compelled to request the company to carry on the concern, and do all that may be necessary up to the 30th of June next.

The Town Council of Batley have reduced the price of gas from 4s. 6d. to 4s. per 1000 feet, with the usual discounts, and have resolved on handing over £1000 of gas profits to the borough fund, towards a reduction of the rates. A general district-rate of 2s. in the pound, and a water-rate of a like amount, were fixed at the same meeting, but it does not appear to have been explained what reductions were made in consequence of the accession of this £1000 of gas profits.

To their sins of commission it would seem that the Exeter Gas Company have added one of omission. They left the city in almost total darkness last Thursday evening, and provoked a demonstration, which resulted in a small riot, calling for the interference of the police. We have not at present any explanation of the cause of the failure, which we fear will increase the unpopularity of the Gas Company. It is so rarely that accidents of this kind occur (and it may be wondered that they are not more frequent), that an easy explanation must be at hand. Probably, a leading main, much too small, was choked with naphthaline.

[Since the above was written, we have read that the local gas examiner has reported that the want of light was due to a large proportion of atmospheric air mixed with the gas. If this explanation be true, what condition can the works be in?]

A "gas eclipse," so far, at all events, as the public lights were concerned, existed for several days in Whitehaven, owing to a dispute between the Town Authority and the Gas Company as to price. The Company were, of course, masters of the situation, and the Authority gave way. A curious incident, and one which illustrates a remark often made, contributed to the triumph of the Company. A man committed a violent assault in the street, and, although four other men were standing near, they failed to identify the culprit, in consequence of the darkness. After that, gas, which is "a terror to evil-doers, and a praise to them that "do well," was relighted in Whitehaven.

We have mentioned, as the instances occurred, that the largest purchaser of gas property at the Mart lately has been the Manager of the Birkbeck Building Society. We have before us the accounts of the Society for the past year, and we notice among the assets the sum of £353,480 invested in gas, water, and miscellaneous shares. We believe the larger proportion of this amount is in gas shares, and it is not to be wondered at. The Society bought at prices to yield from 4¾ to 5 per cent.; and they pay their depositors 3½ and 2½ per cent. The question arises, why do not the public invest in gas directly for themselves, and secure the higher rate of interest?

We see with much regret that Mr. Cleminshaw has, on his

own behalf, and that of Messrs. Pritchard, Church, and Stevenson, felt himself compelled to make a final appeal to the *honour* of the Corporation of Dublin, for the settlement of their claim. This claim, we think we are right in stating, now only amounts to the sum actually paid out of pocket, and includes no remuneration for services rendered. The Corporation deny that they received any benefit from these services, which, in a certain sense, is true. The Gas Company, they say, profited by them; and, therefore, the Company should pay the debt really incurred by the Corporation. We do not see that the Company are under any obligation to discharge liabilities they never entered into; but, under the peculiar circumstances of the case, we cannot help thinking that they might assist the Corporation in doing justice to the claimants. The whole sum now amounts to only £1500, and a public subscription, proposed to redeem the "honour" of the Corporation, brought £150, one-third of which was contributed by the Chamber of Commerce. Nothing more is to be expected of the Corporation, so we think it right to commend the case of the defrauded engineers to the consideration of the Gas Company.

Not having the happiness and honour of belonging to the "free and accepted" craft, we do not know whether or not we are violating the law or practice of Freemasonry when we make an announcement which may interest some of our readers. On this day fortnight there will be consecrated, with all the customary pomps and ceremonies, a new masonic Lodge, the members of which will consist exclusively of gentlemen more or less connected with gas undertakings. It has, very appropriately, been named the "Evening Star" Lodge. The officers elect are all leading men in our industry, and that the lodge is likely to become popular may be inferred from the fact that, after the ceremony of consecration, several gentlemen are to be initiated—with the usual pains, we presume. Any Manager wishing to experience these pains, should apply to Mr. Magnus Ohren, of the Crystal Palace District Gas Company, who is the Secretary Elect of the Lodge.

Water and Sanitary Notes.

The members of the Metropolitan Board of Works have received something to cogitate—we do not say dream—over during their recess, in the shape of a report from their Chief Engineer and Messrs. Bramwell and Easton, on the means of obtaining an efficient supply of water for the extinction of fires, and for other purposes. The other purposes, we may say at once, are drinking and cooking. It seems to be assumed by the gentlemen we have named, or, perhaps, it ought to be said that they fall in with an opinion often repeated, but never substantiated, that the water now supplied by the London Water Companies is unfit for drinking and culinary purposes. They further assert, and here all must agree, that the present service does not allow of the use of hydrant-jets for the extinction of fires. Two things, then, have to be provided. First, a supply of potable water free from contamination, and, next, a high-pressure service. How these two things are to be furnished is the subject matter of the report, which we publish *in extenso* in another column. As all our readers may not care to go through the document, we briefly summarize the proposals and recommendations. It is, then, proposed to establish a service of water entirely distinct from, and in addition to, that now furnished by the Companies. To obtain the "potable" water, it is suggested that twenty wells should be sunk in the chalk to the south, south-east, and north of the Metropolis; that about double this number of pumping-stations should be established, from which the water would be raised to four covered reservoirs, situated from 300 to 400 feet above Ordnance datum. From these reservoirs mains and pipes are to be laid under the pavement of every street in London—one down each side—and a service-pipe is to be laid to every house. It is assumed, and we are inclined to think correctly, that two gallons per head per day are all that is necessary for drinking and cooking purposes, and that this, added to the quantity estimated to be required for the extinction of fires, would not amount to more than eight and a half millions of gallons per day. It is proposed to make the reservoirs of a sufficient capacity to contain four days consumption. With regard to cost, it is estimated that five and a half millions will suffice for everything, including the household fittings, which are to be supplied *gratis*. The money borrowed at 3½ per cent. will involve an annual charge of £192,500, and the cost of maintenance and management added, the whole amount to be raised by a rate will be £225,000. Against this are ingeniously put some conjectural "set-offs," which make it appear that by the adoption of this plan, as opposed to a high-pressure service furnished by the Water Companies, a saving of £137,000 a year would be effected. We refer our readers to the report for a detailed statement of the figures.

The domestic arrangement proposed is certainly ingenious, and we have little doubt would prove efficient; but there might be some liability to get out of order, in which case it would take time to remedy defects. But, as regards the supply of water for the extinction of fires, we might almost say that the design is perfect. With hydrants sufficiently numerous, a serious fire ought not to occur. But then hydrants require hose, and men to attach it, and we really do not see how any great saving can be effected in the cost of the Fire Brigade if this double service system be adopted. Fewer engines would be wanted, but almost as many men would be necessary, and the utmost, we think, that could be saved would be the outlay required for the suggested extension of the brigade.

There has been but little time for a consideration of this scheme; but we think we may say at once that it will not go down. It may captivate some minds, anxious for a change, for a moment, but on full reflection we believe it will be seen that a double service system is out of the question. It is claimed as a merit for this proposal, that it does not interfere with the existing Water Companies; but it is easy to see that it might, and probably would, most seriously interfere with their interests. The metropolitan ratepayer will hardly be content to pay, let us say, a threepenny public water-rate, and also the rate charged by the Water Company. The general public will see at once that "potable" water, as it is called in this report, is not required to extinguish fires. They might pump tidal water below London Bridge, which would be far more suitable for the purpose. Only a few, whom we here designate "enthusiasts," find fault with the present supply, and that for reasons best known to themselves. When it has been shown that the district supplied by the Kent Water Company, all things being equal, is more healthy than the district supplied by the New River Company, we shall believe in the virtues of chalk water. But according to present information, we have unlimited faith in the excellence of our present sources of supply. We admit that if hydrants are to be introduced, we require additional high service reservoirs; but we have before pointed out that these may be constructed by the companies, and if a double service be necessary, we are certain that it can be much more economically established by the Companies than by the Metropolitan Board. The water question cannot be dealt with in the half-and-half way now suggested. The entire system must pass into the hands of some public authority, or the matter must be left as it stands. Parliament, we are certain, will never sanction the expenditure of five and a half millions on this scheme, if the expenditure of an additional £50,000 a year only be required to make the Fire Brigade equal to the metropolitan wants. We shall return to this matter when it comes up for discussion some weeks hence.

The accounts of the Metropolitan Water Companies for 1876 have been presented to Parliament, in accordance with the provisions of the Act of 1871, and have been ordered to be printed. They will be issued in the course of a month or two, and then we shall give our usual abstract.

Mr. Whalley may be said to have distinguished himself as a useful legislator. Forgetting for a short time the Pope and the injured young nobleman languishing in Dartmoor prison, he has succeeded in carrying his Reservoirs Bill (which received the Royal Assent on the 2nd inst.), not, indeed, in the form in which he originally introduced it, but still preserving its chief feature. We have before described its provisions, and have pointed out the difficulties which may arise when an attempt is made to put the Act into force. Any landlord may dam up water on his estate, but who is to say what claims for compensation may be made by contiguous proprietors who may have an interest in the water? Nevertheless, we are bound to say that the Act may prove a very useful measure. It gives to enterprising and philanthropic landowners, in many places, the opportunity of conferring great benefits on their neighbours, with the chance of reaping reasonable returns.

The Rivers Pollution Prevention Act comes into force on the 15th inst., and, in view of this event, the Local Government Board have issued a circular to Sanitary Authorities, calling attention to the proceedings authorized by the Act, in respect of offences arising from the pollution of streams by sewage, or by manufacturing or mining refuse. The one thing positively forbidden by the Act is the shooting of solid refuse into streams. As regards other pollution, a marked distinction is drawn. No fresh sources of pollution are permitted, but in the case of sewage and liquid manufacturing refuse flowing along channels already charged with the refuse, time will be allowed for the abatement of the nuisance. In the case of sewage pollution of old standing, the Local Government Board

may, and we think very properly, practically suspend the operation of the Act, until an offending authority have done what they consider their best to prevent pollution. It is remarkable that in this, as in many similar Acts, private persons are, as far as possible, restrained from taking action. The duty of prosecuting lies mainly with the Sanitary Authorities, and for this reason the Central Board point out the duties of these bodies. When the Act was passed last year, we observed that it might do but little to mitigate existing evils, but that it ought to prevent the introduction of additional sources of pollution. As to how far this may prove advantageous to manufacturing interests, we refrain from expressing an opinion. An existing factory may continue to pollute a stream for an indefinite period of time; a newly started one may be proceeded against at once, and put to heavy charges to purify and dispose of refuse matter. The competition in such a case will be very unequal. We reserve further comment on this circular, for which we hope to find space in our next issue.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

CXLII.

VALVES (*continued*).

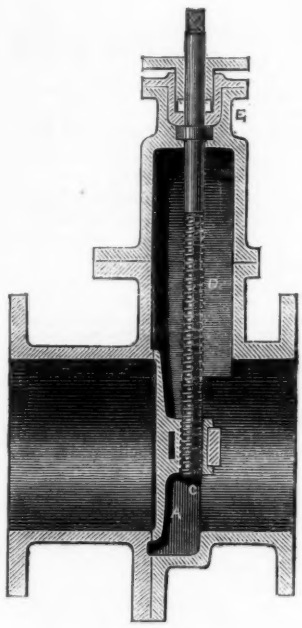


FIG. 5.

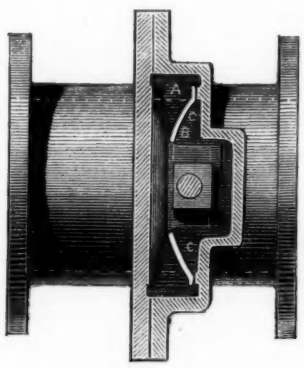


FIG. 6.

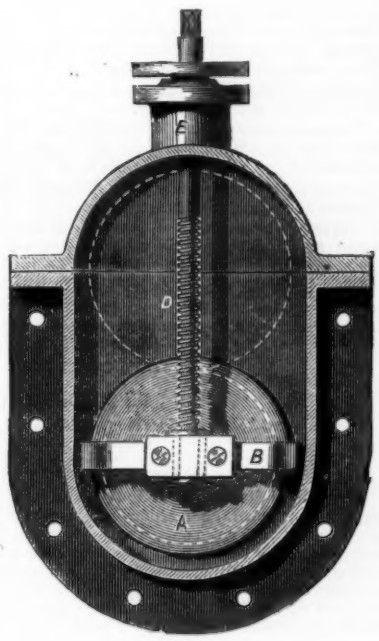


FIG. 7.

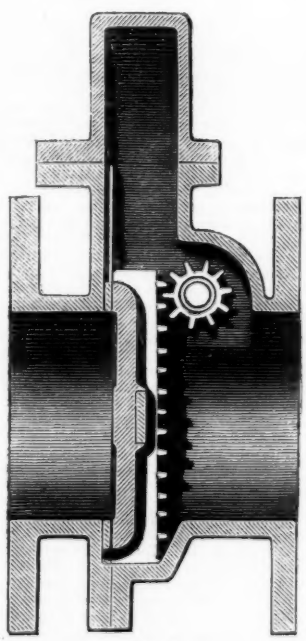


FIG. 8.

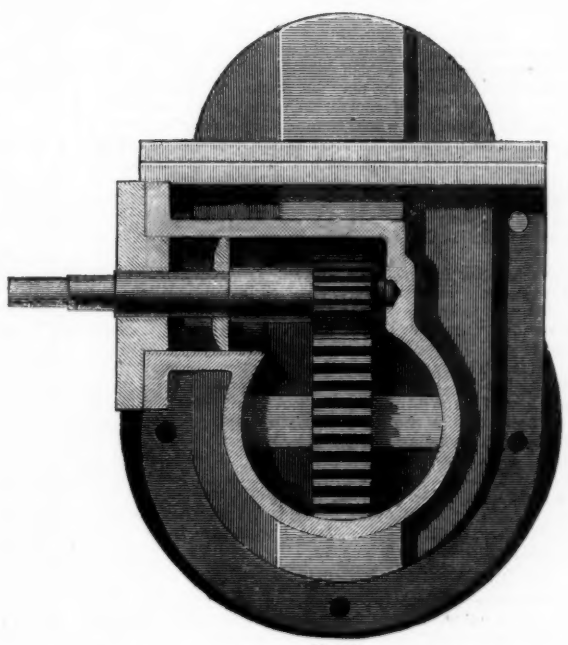


FIG. 9.

A slide-valve is one whose disc or gate slides backward and forward over the opening or orifice through which the flow takes place.

Slide-valves raised by a screw, actuated by a handle, were in existence on water-mains long before gas was practically applied for lighting. They were worked by a screw, because the pressure of water in pipes is usually great, and as the water is heavy, it is apt to break the valve or burst the main if the momentum of its flow is suddenly arrested. Neither of these reasons applies to gas, therefore it is not essential that the comparatively slow motion obtained by the screw should be continued with valves of that description hence the rack and pinion valve was introduced, which admits of the opening of the slide or gate with a few turns of the handle or hand-wheel.

One description of slide-valve is shown in the annexed engravings. This represents one of the earlier forms. Fig. 5 is a vertical section, fig. 6 a sectional plan, and fig. 7 a section through the valve-chamber. A is a cast-iron disc, faced to fit gas-tight, and pressed by the spring, B, against the part, C, of the valve-box which is also faced. The disc or door, A, on being raised or depressed by the screw, D, opens or closes the gas passage. E is a stuffing-box through which the screw-spindle works. The latter has a collar

upon it, as shown, working in a socket, to prevent the spindle or shaft from rising on being turned by the handle, the disc only being raised and lowered by the action of the screw. The upper dotted circle in fig. 7 is intended to show the position of the door when the valve is open.

A rack and pinion valve, known as Donkin's valve, is illustrated in figs. 8 and 9, the former being a section through the centre, and the latter a back internal view. This valve, if fixed above ground, may be placed in the upright position as shown; and if connected to mains underground, it may be laid on its side, with the spindle pointing upwards. It is particularly well adapted for shallow mains, as the vertical space it occupies is little more than that taken up by the diameter of the main itself.

Great difficulty was experienced for years in obtaining a slide-valve, whether actuated by a screw or a rack and pinion, that was absolutely gas-tight, or that would remain so for a reasonable time under all the conditions of its working. Comparatively few valves came up to this standard of perfection. There was, generally, more or less of leakage past the gate after they had been in use a short time, and their defects in this respect increased as the deposit of particles of tar and naphthaline accumulated and hardened upon their surfaces. The faced parts were frequently not tight in the first instance, or the whole valve was made so light as to be easily sprung in the fixing or the working.

Gas machinery and apparatus of all kinds have undergone improvement within the past 25 years, and slide-valves are now constructed of the best materials, of proper strength, and of such excellence in workmanship by different makers, as to justify the highest encomiums in their praise.

Valves, wherever fixed, should be accessible, in order that the cover or bonnet may be easily taken off when required to give access to the interior for cleaning or repair, and with that view, when laid in the ground, they should be placed in a cast-iron box pierced for the main at opposite sides, or in a space bricked round, and covered by a flag or other moveable top.

(To be continued.)

Correspondence.

[We do not hold ourselves responsible for the opinions expressed by Correspondents.]

SULPHUR PURIFICATION.

Sir,—My letter in your Journal of the 10th ult. has called forth replies from several correspondents, most of which I can well afford to ignore; they do not contain any arguments, but simply outbursts of angry feeling and of paltry personalities, such as clumsy attempts to ridicule my nationality, and, by implication, to show up my ignorance of English feeling. These last are simply amusing to me, because, proud as I am of being a German by birth, I cannot forget the fact that for nearly a quarter of a century I have lived in this country, during most of which time I have constantly been consulted as a practical chemist about many large industries, among others the manufacture of gas. I very much doubt whether one of your correspondent's intimate knowledge of the two countries is so much superior to my own—his comparison of sanitary matters does not much favour the assumption. However, I do not intend to enter into anything like a detailed reply of the whole correspondence; I refuse to do so. I hold certain views, and I have expressed them, may be, rather strongly; other people hold different views, and, of course, they are equally entitled to them; as, for instance, yourself, when, commenting on my letter, you quote the expression of "one of the most eminent of living expert witnesses," that "there is always something to be said on both sides, and I always take the case first brought to me." This kind of argument surpasses my comprehension in such a case as the question of sulphur in gas, which to common sense must either be injurious or not injurious, and I, for one, cannot realize the idea of simply looking upon science as a milch cow.

To Mr. Pattinson's letter I must, however, reply in direct and implicit terms; and, in so doing, I regret the delay, which is simply due to my absence on a holiday trip abroad, whence I returned only yesterday.

I had compared Mr. Pattinson's figures in his evidence and in his report published in your Journal a few days afterwards, which, to my mind, do not agree. They are open to the explanation given by him, and I have no hesitation in assuring Mr. Pattinson that I never intended to accuse him of any wilful misstatements, and that I certainly did not mean to apply to him the somewhat strong expressions which I used in speaking of the evidence generally.

In conclusion, I must state that the correspondence subsequent to my first letter has not altered my opinion, and that I do not feel inclined to continue the discussion of the question.

Fredk. Versmann, Ph.D.

Analytical Laboratory, 35, Whitecross Place, Wilson Street, Finsbury, London, E.C., Aug. 11, 1877.

Presentation to the late Manager of the Macclesfield Gas-Works.—On Friday night, the 29th of June, the gas *employés* met at the gas-works, and made a presentation to the late gas manager. The presentation comprised a framed address, which stated: "This testimonial, together with a portrait of his father, and a timepiece, was presented to John Henry Lyon by the *employés* in the gas department of the Macclesfield Corporation, on his retirement from the managership of the gas-works, who, having experienced on all occasions his uniform kindness and courtesy, wish in this way to mark their appreciation of conduct so honourable; hoping that he may long be spared to enjoy the respect and esteem so unanimously accorded to him, and with the best wishes for his future welfare. June 29, 1877." The address was beautifully written and embellished by Mr. F. W. Malburn; the portrait is in oil on porcelain, by Bullock and Son, and the timepiece is a handsome black marble and granite, by T. Swaine. The presentation was made by the oldest *employé*, and after a few remarks by several of the *employés*, Mr. Lyon feelingly responded.—*Macclesfield Courier.*

Parliamentary Intelligence.

HOUSE OF LORDS.

Monday, Aug. 6, 1877.

The Bishop Auckland District Gas, Burslem Local Board, and Louth Gas Bills received the Royal Assent by commission.

Tuesday, Aug. 7.

UNITED GENERAL GAS COMPANY (LIMERICK) BILL.

On the motion for the third reading of this Bill,

The Earl of Limerick presented a petition, from Ratepayers and merchants in Limerick, against any clause authorizing the purchase of the works by the Corporation of the city of Limerick, as that corporation were already heavily burdened with debt.

The Earl of Redesdale moved an amendment, the effect of which was to require the corporation to bring in a Bill and obtain the sanction of Parliament, in case of any arrangement being made between them and the company to buy the works.

The amendment was agreed to, and the Bill was read the third time, with the amendments, and passed.

Friday, Aug. 10.

The Local Government Board's Provisional Orders Confirmation (Hyde, &c.), the Kent Water, and the Tudhoe and Sunderland Bridge Gas Bills received the Royal Assent by commission.

HOUSE OF COMMONS.

Monday, Aug. 6, 1877.

The Lords amendments to the Kent Water and the Tudhoe and Sunderland Bridge Gas Bills were agreed to.

Wednesday, Aug. 8.

The Local Government Board's Provisional Orders Confirmation (Hyde, &c.) Bill (Lords) was read the third time, and passed without amendment.

Thursday, Aug. 9.

PUBLIC HEALTH (IRELAND) BILL.

On the order for going into committee on this Bill,

Sir M. Hicks-Beach said he was very anxious the Bill should have become law this session. It was almost entirely a consolidation Bill; but there was opposition to it, and he felt it was hopeless to ask the House now to proceed to consider, in committee, an opposed Bill, consisting of 300 clauses. He would therefore postpone it till next session.

Progress was therefore reported, and the Bill withdrawn.

Friday, Aug. 10.

The accounts of the Metropolitan Water Companies for the year 1876, which have been prepared in pursuance of the Metropolis Water Act, 1871, were presented.

Saturday, Aug. 11.

The Lords amendments to the United General Gas Company (Limerick) Bill were agreed to.

HOUSE OF COMMONS COMMITTEE.

Tuesday, June 5.

(*Before Mr.* Richard Bright, *Chairman; Viscount* Folkestone, *Mr.* Ernest Noel, *and Mr.* Arthur Vivian. *Mr.* A. Bonham-Carter, *Referee.*)

WATERFORD GAS BILL.

Mr. Richards, Q.C., and Mr. Michael appeared for the promoters; and Mr. J. D. Fitzgerald, jun., for the Corporation of Waterford, opponents of the Bill.

Mr. Richards, in opening the case for the promoters, said that the Waterford Gas Company were incorporated by the City of Waterford Gas Act, 1858, with a capital of £16,000, in 1600 shares of £10 each, and were empowered to borrow £4000. The whole of that money had been expended, and also £6767 out of the revenue applicable to dividend. An agreement was in existence between the company and Messrs. Anderson and Jones who were joint managers and contractors, for 14 years from June 25, 1872. The business of the company was increasing, and additional capital was required. Out of the original capital of £20,000, £12,000 had been paid to the old company for the works; the parliamentary contest with the Waterford Corporation in obtaining the Act had cost £2000, so that the company had to commence business with a working capital of only £6000. The agreement with Messrs. Anderson and Jones was originally entered into in 1858, and renewed, with some slight alteration, in 1867. The price of gas was fixed in 1858 at 6s. per 1000 as a maximum, which, considering the size of Waterford, was a very moderate price. There was, however, a system of discounts to the consumers, so that the average price of gas was only 5s. The consumption of gas had very much increased from 1858, when it was 13,800,000 cubic feet, to the past year, when it was 30,842,000. The management had been singularly economical. Mr. Anderson, having provided everything, paid the staff, and produced gas of a good quality at a fixed charge of 3s. per 1000 feet. There were three directors, who divided among them £25 each half year; a secretary and accountant who received £20 each half year; and the audit cost £3 per half year; so that the cost of management was very moderate. The company had invested £6767 out of their profits, and now proposed to capitalize £4000 of this amount at 5 per cent., being a total of £200 a year, for the benefit of the public of Waterford. The new shares to be issued were to the extent of £16,000, and on this amount they proposed to pay 7 per cent. dividend. The auction clauses had been introduced in the Bill, and there was also a clause giving the Corporation of Waterford the right to purchase the works within a given period, if they should decide on so doing. The Corporation of Waterford had petitioned against the Bill, alleging that it contained provisions injurious to the interests of the citizens of Waterford, and that the company were asking for power to raise their capital to £40,000, which would increase the annual charge of £1800 by an addition of £1570. Of course, as the capital was called up the annual charge would increase, and might ultimately be as much as that, but until the capital was needed it would not be called up. The petition also alleged that the agreement with Messrs. Anderson and Jones was illegal and *ultra vires*. The corporation had had two arbitrations with the company with regard to the public lighting, and had been defeated each time. It was also complained that the Bill perpetuated the agreement, and postponed the operation of the Gas-Works Clauses Act of 1871. Though he did not propose to abandon that point, he was ready to leave it to the committee rather than allow the corporation to say that the company were acting unfairly, and if the committee thought it right the Act of 1871 might be introduced into the Bill. The average dividend paid had been £6 14s. per cent., and it had never been more than £8 per cent., though they were entitled to divide £10 per cent. The corporation had sued the company, under the Act of 1847, for not sending in their accounts, and a penalty of £20 had been inflicted.

The following evidence was then called :—

Mr. *John Henry Sugrue*, examined by Mr. MICHAEL.

I am a merchant residing in Cork, a magistrate of that county, and also a magistrate of the county Kerry. I hold 78 shares in the City of Waterford Gas Company, have been a director of the company since 1861, and chairman since 1867. I have from time to time visited the works of the company, and have taken part in preparing the details of the Bill now before the committee. Up to the time of the lodging of the Bill the sum of £6774 had been expended out of undivided profits; since then a further sum has been so expended, making in all £6914 3s. 2d. Those extensions were absolutely necessary, in consequence of the constantly increasing demands for gas. Since 1858 the supply of gas has more than doubled. During the same time we have paid one dividend of 4 per cent.; two dividends of 5 per cent.; fifteen of 6 per cent.; three of 7 per cent.; five of 7½ per cent.; and ten of 8 per cent.; the average being £6 14s. 8¾d. By our present Bill we only seek to capitalize £4000 out of the £6900 we have expended; therefore, we practically make a present of £2900 to the city of Waterford, through not applying before for power to raise additional capital. The gas has been made by Mr. Anderson under agreement, and I believe that system has acted beneficially to the consumers, mainly on the ground of there being no shareholders in Waterford. I also believe that the concern has been worked with efficiency and great economy under that agreement. There are three directors, who divide £50 a year between them, but it was formerly less than that. We pay the secretary £40 a year, and the auditors £3 a year each. There are also office-rents, stationery, and some small items. In the half year ending June, 1876, we paid for engineering £1 1s.; income-tax, 16s.; audit, £3; secretary and accountant, £20; directors remuneration, £25; and office and ground rent, £23 5s. 7d. In round numbers, we have paid for the production of our gas 3s. 2d. per 1000 cubic feet, subject to the reduction in the price of coal and the quantity of gas made. So far as I can judge from the experience of other towns, I consider it a moderate price. I also consider our charge for gas moderate as compared with other towns.

Cross-examined by Mr. FITZGERALD: I consider our price moderate as compared with Cork. I do not know of any town in England, Ireland, or Scotland, including Waterford, where 10-candle gas is supplied, although that is the amount mentioned in the Act. The price in Waterford is 6s. per 1000 feet, but the company allow a discount of 10 per cent. in certain cases. The directors and solicitor reside in Cork, and the head-quarters of Mr. Anderson are in London. Messrs. Anderson and Jones were the managers of the company from the commencement, but Mr. Jones has no connexion with the concern now. I never looked upon Mr. Anderson as lessee of the works; I looked upon him as employed to make gas for the company, and nothing more. He has complete control over the manufacture of gas, and within the walls of the works all the persons employed are engaged by him. The coal is purchased by Mr. Anderson, but the company have the accounts for it. The original capital of the company was £16,000 in shares, and £4000 to be raised by debentures; but when I joined the company I found all the capital had been called up and expended. Of the £20,000, £12,000 was expended in the purchase of the then existing gas-works, and the other £8000 has been expended since. I have not the accounts here to show how that money was spent; but I know there was a large gasholder built. I generally visit Waterford once a year—sometimes oftener—and one of the other directors usually goes with me. I am not aware that the population of Waterford has decreased during the last 20 years. In 1874 we introduced a Bill similar to the present one, but it was withdrawn before it went before a committee. In that Bill we asked for an extension of capital to the amount of £8000, with borrowing power of £2000; but since that time there has been some alteration in the fees of the House, and that made us ask for the extra capital. We ask for £16,000 now, because the £8000 we applied for then would have necessitated our coming to Parliament much sooner than we shall do if we get the powers now applied for. We have no intention of using all that money immediately. I am aware that under the Act of 1847 we are bound to lodge our accounts with the clerk of the peace, and I am informed that that has been done. In 1874 we were proceeded against and fined £20 for not doing so, but I may explain that those accounts would have been lodged but for the unexpected illness of the accountant who was making them up. Since that fine was inflicted we have done so regularly. In our accounts we give no statement of the amount of gas manufactured, the quantity of coals purchased, nor the amount realized by the sale of residuals.

Mr. FITZGERALD: Have you ever seen any other gas accounts given under that Act of Parliament in that form?

Witness: Not being a shareholder in many other companies, I have quite enough to do without looking into other companies accounts. I have seen other accounts in the same form, but not of a company under parliamentary sanction. I have seen the form given in the Act of 1871, and am aware that the items mentioned ought to be given. According to the accounts for 1876, the sum of £5359 14s. was paid to Messrs. Anderson and Jones. The basis on which that is arrived at is that Mr. Anderson furnishes us with the amount of consumption, and collects the rental for us, and we pay him the sum due to him under the agreement on that rental, calculated at so much per 1000 feet. That sum varies; under the agreement we pay 3s. 2d., advancing or decreasing according to the price of coal and the consumption. I do not know what Mr. Anderson's profits are, but I presume he does not work for nothing.

Mr. FITZGERALD: There are two kinds of profit made on the manufacture of gas in Waterford—first, the profit made by Mr. Anderson; and secondly, the profit made by the company?

Witness: The profit on the manufacture of gas is divided between the company and Mr. Anderson.

And if Mr. Anderson makes 8 per cent., and the company make 8 per cent., the total profit on the manufacture of gas is 16 per cent., is it not?—If such were the case; but we felt that we had to consider what we could make gas for ourselves, and we believed we could not work the company ourselves—employing engineers, accountants, solicitors, and paying directors to give their attention to the works day by day—and deliver gas at 3s. 2d. per 1000 cubic feet.

Why not?—Because we find that in the case of other towns with a larger consumption it costs them as much, or more.

Cross-examination continued: Our company have never manufactured gas themselves, and, therefore, have had no experience in the matter. The present price of coal landed at the works is, I think, about 19s., including the cost of delivery into the works. I am not a gas manufacturer, and, therefore, cannot say what it would cost to produce 1000 feet of gas.

Mr. FITZGERALD: You think that you and the other directors living in Cork, and Mr. Anderson and Mr. Jones, both living in England, can manufacture gas more cheaply than a company?

Witness: I believe that a company who have the advantage of such professional skill as Mr. Anderson possesses, and who is able to give it at a minimum cost, by reason of his being connected with various other companies throughout Ireland and England, can procure the gas at a much cheaper rate than if they manufactured their own gas.

Cross-examination continued: I do not know how often Mr. Anderson goes to Waterford, but I suppose as often as he thinks it his interest to do so. For the last four or five years we have divided 8 per cent., and during that time we have also expended a certain sum out of profits—I think about £2000.

Mr. FITZGERALD: That would amount to over 2 per cent. per year, would it not?

Witness: Yes; I presume it would.

That would bring it over 10 per cent. for those years; and then if you add to that Mr. Anderson's profit, taking it at 8 per cent., that would make 18 per cent. as the total profit on the manufacture of the gas?—I do not take Mr. Anderson's profit at that.

You have stated in the accounts that £6514 have been expended out of revenue, on capital account, but it is not shown in any one of the items how the money has been expended?—From the year 1868, every item can be accounted for. [Witness was examined as to the details of several items.]

Cross-examination continued: With regard to existing mains, if there is to be any enlargement of them, the managers, I presume, pay for that; we pay for nothing but new mains. I cannot give any evidence as to a depreciation account, as we have never had to deal with such an item. The land which is scheduled in the Bill I believe to be the same as that described within the limits of the Act of 1858. With regard to the gasholder, the tank was being erected last summer, but the work has been suspended for some time. It will be paid for by the company. The gasholder will not be on the land which was described in the Act of 1858.

Mr. FITZGERALD: If this agreement with Mr. Anderson remains in force to the year 1886, all the repairs on the works are to be done by him; is that not so?

Witness: The actual works handed to him he must keep in repair. We make new works from time to time.

In what way do you expect you will have to expend any large amount of capital in the next few years—for what?—We have been called upon by the corporation, and we are called upon every day, for extensions and extra lamps.

Beyond the sum for extra lamps, and possibly some service-pipes, there is nothing requiring an immediate expenditure of capital by the company, is there?—I presume we shall require more capital if the consumption goes on increasing in the same ratio it has done, and we shall also require more capital for manufacturing purposes, and for storing power, within the next five years.

Re-examined by Mr. RICHARDS: If we adopt the auction clauses, it is quite immaterial whether we get £16,000 or £60,000, because we shall be bound to issue only such capital as we require. If the capital is issued, and stands at a premium, the public will, of course, get the benefit of it. By the Act of 1858, we were entitled to charge meter-rent, but we have not done so for many years. We have a small reserve-fund of £1047, but we might have increased it up to 10 per cent. on the capital. The money which has been expended came out of our own pockets, and would not have been spent unless we were sure it was necessary. I have either personally satisfied myself of their genuineness, or sent over Mr. Harris (the engineer) to ascertain the money has been actually expended as represented, and we have had vouchers for all the expenditure.

By the COMMITTEE: I should say that all the principal parts of the town are lighted, but in Waterford there is a wide river, and extensions are being sought for to the opposite side, but we have no means of doing that. When I have been to Waterford with our engineer, he has admired the gas both in the public streets and private houses, and has said that he considered it equal, if not superior, to the Cork gas, which is bound to be 14 candles. The gas has never been tested in my presence, but I know it has been, and that the results were over the required standard.

Mr. BONHAM-CARTER: You have not given us the amount of gas sold in any one particular year?

Witness: We have the accounts furnished by Mr. Anderson to us, and they show it. They show that a small fraction under 5s. is the average price of all the gas. The price paid by large consumers amounts to 4s. 7d. and a fraction. The discounts are under the original Act, in deference to the people of Waterford themselves.

Mr. RICHARDS called attention to the 28th section of the Waterford Gas Act of 1858, authorizing the appointment of an official tester, and inflicting a penalty of £20 in case of non-compliance with the provisions of the Act.

Mr. *Robert Paulson Spice*, examined by Mr. MICHAEL.

I was at Waterford two or three years ago, acting as arbitrator between the company and the corporation with regard to the public lamps. On that occasion I examined the works, which are practically the same now as they were then, and are very well adapted for the purpose for which they are designed. The manufacture of gas is carried on strictly in accordance with modern principles and practice. The coal employed is of the best description—either Ravensworth Pelaw or Pelaw Main. The illuminating power is generally 15 candles, which would be the natural production when gas is properly made from such coal.

Mr. MICHAEL: Therefore, while the company were only bound to supply 10-candle gas, they were supplying 15-candle gas, and that would represent, of course, a very considerable amount in the way of money on the price charged for 10-candle gas?

Witness: Yes. People would only want to use two-thirds of it to produce the same result.

Examination continued: I have been concerned this session for four cities in Ireland — Londonderry, Waterford, Dublin, and Limerick. Looking at the circumstances of the Waterford case, the price charged for gas is a very moderate one. Limerick supplies only about half the quantity of gas that is supplied in Londonderry, and the price in Londonderry was, until the last six or nine months, 5s. 5d. per 1000 feet. It was reduced in Limerick to 5s. for the purpose of avoiding opposition to the company, when they applied this session for an Act; therefore, 5s. 5d. was the price at Londonderry at the same time that gas was sold at 5s. in Waterford.

Mr. MICHAEL: Where you burn a large quantity of gas within a limited area, the cheaper is the price at which the gas can be produced?

Witness: Yes. The unaccounted-for gas is smaller in proportion, and there are certain fixed charges which remain, whether the thing is double or treble the size.

Where you have a long length of main in a sparsely populated district, the supply is not carried on so remuneratively?—No; and it requires more capital in proportion than in a place where the supply is concentrated.

Examination continued: In many of the streets in Waterford the consumers are of a small class, and the return per mile is small compared with other places. The main consumption is all located in one part of the city, and therefore the other portion is spread over a large district, making it unremunerative to supply it. There is also a larger proportion supplied to the public lamps, compared with the private rental, than is common in similar sized cities. I think the agreement under which gas is supplied by Mr. Anderson is an extremely favourable one for the company and for the consumers also. I know by comparison, without going into the exact cost of gas at Waterford, that what Mr. Anderson is doing there is better than other companies similarly situated in Ireland are doing for them-

selves. If the company were to manufacture gas for themselves, it would cost them above 3s. 6d. per 1000 feet, whereas now under the agreement it is only costing them 3s. or 3s. 2d.

Mr. MICHAEL: They have to take upon themselves bad debts, all renewals, all repairs, and the whole of the matters besides the manufacture of gas, leaving the remainder clear net profit of the company?

Witness: Yes. Gas companies take upon themselves risks which are thought more of now than they were formerly, gas explosions destroying a house, for instance, which is paid for in the first place by the fire insurance companies. The fire insurance companies have lately not found much difficulty, if any, in getting that returned to them from the gas companies, if they can trace the explosion to the mains being defective through their being broken. There is an important case between a gas company and one or two insurance companies and the Corporation of Brighton. The Corporation of Brighton had a heavy steam-roller which was said to have broken a gas-main; a serious explosion took place, and a house was blown to pieces. The insurance office sought to come down upon the company, but they found that it was not the fault of the company but of the corporation, through the steam-roller breaking the main. There is also the case of the landing-stage at Liverpool, which cost a very large sum of money, and which was destroyed through an accident while the fitters belonging to the gas company were doing some fittings underneath the stage. In Wood Street there was a fire which cost some £30,000; and there was the fire at Savile House, which cost the Chartered Company I do not know how much, but a large sum of money. It is pretty well understood that gas companies do run these risks, and it is a risk that pertains to the lessee of gas-works. I have had to suffer, as a lessee of gas-works, myself. Some mains were put down by my men at Wandsworth, and it turned out that they had used a second-hand main which had a small pin-hole from a pick in it; the gas escaped from it, and got up a drain and underneath the floor of a house, and blew the house across the street, and I had to pay for it. It was proved that it was a defective main. Those risks Mr. Anderson has, and the company are relieved from them.

Therefore the company know beforehand, without running those risks, exactly what the gas is to cost them. That being the case, do you say to the committee that it is a provident thing not only for the shareholders but for the gas consumers that such an arrangement should be entered into?—Yes; and what is good for the company must be good for the consumers. The better the terms the company can effect, or the lower the cost at which they can obtain gas, so much lower a price can they sell it at.

If this agreement were put an end to, the company would have to do the same thing that Mr. Anderson is doing?—Yes; but they could not do for themselves that which Mr. Anderson is doing for them, and which he is enabled to do by reason of the facilities which he has for dealing with residual products, and so on. They get the benefit of Mr. Anderson's great skill without paying anything for it. It would not answer their purpose to employ a gentleman like Mr. Anderson, with his skill and experience.

Examination continued: I have no doubt that £6900 has been expended out of undivided profits, and I should have advised the company to ask for £6000 at 7 per cent., on the principle that if they had applied to Parliament when they wanted the money, instead of using it out of profits, they would have been authorized to expend capital which would have borne 7 per cent., and therefore the consumers would have been in no worse position. They have foregone a privilege in an extremely liberal spirit, and that liberal spirit has appeared the whole way through the transactions of the company.

Mr. MICHAEL: Would you not go further than that? Have not the consumers been saved that amount of capital, and 7 per cent. upon that £6000 which would have accrued?

Witness: Yes. No interest nor dividend has been paid all the time the money has been laid out, so the company have not acted wisely. If they had regarded selfish principles, they would have come before for further capital.

They are now losing, and have been losing every year, the dividends which would have accrued upon the £6000?—Yes; and that has been to the benefit of the consumers, for which the company get no gratitude.

Examination continued: Looking at the progress of the company since 1858—the supply having more than doubled itself—there is a necessity for further expenditure to meet those requirements. Owing to the recent Standing Order, it is necessary that all fresh capital should be raised by auction, and that, of course, destroys any interest the existing shareholders can have in any increase in the capital of the company. I would also say, from my experience of 30 years among gas companies, that the idea that these companies are anxious to increase their capital is a pure fiction. I find the greatest difficulty in inducing companies to expend sufficient capital. Notwithstanding the fact that in some cases they have had the right of alloting shares, *pro ratâ* amongst themselves, that would have commanded a premium of 40 per cent., the directors have been very reluctant to increase the capital. They have the idea that if they keep the capital down they are in a better position to withstand anything like an opposition, or a new company springing up, or a corporation threatening to swallow them alive. The capital of this company is about £720 per million feet of gas, with some it is double that figure; I have known £2000 per million feet. I do not think the capital applied for is more than the exigencies of the company demand, and is not so much as is usually asked for. The cost of indulging in the expensive luxury of coming to Parliament comes out of the pockets of the consumers eventually; and it is a great folly on the part of a corporation to enter into an unnecessary opposition, which this is, in my judgment; there never was a clearer case.

Cross-examined by Mr. FITZGERALD: Capital is only asked for and employed by gas companies as the concern which they have to develop requires it. The interests of consumers and companies are identical. The lower the rate at which a company can supply gas, the more comfort and satisfaction there is mutually between the company and the consumers. There is no advantage in a company employing more capital than the concern requires, and I cannot help consumers being of a different opinion.

Mr. FITZGERALD: You have met with skilled gas engineers who are of the same opinion as the consumers, have you not?

Witness: All gas engineers are not sensible men. There are some who do not know their business at all.

You have said that you consider this agreement with Mr. Anderson very favourable to the company?—The company could not do so well for themselves as Mr. Anderson is doing for them under that agreement. It is within my own knowledge that Messrs. Anderson and Jones entered into an agreement with the Dover Company for seven years, and before that time expired another agreement was made, and before that expired a third was entered into, continuing the management in their hands. When they took the works the consumption was 30 millions, and now it is over 100 millions, and that is strong evidence in favour of such a mode of conducting a concern. The Dover Company were established before the Gas-Works Clauses Act of 1847.

Are you aware that the opinion is very generally held that such agreements as these are illegal in the case of companies established after 1847?—This is a perfectly legal agreement. A statutory gas company could not enter into an ordinary lease to let their works to individuals, but it is competent for a statutory gas company to enter into such an agreement for the management upon terms mutually advantageous; at all events, there is no question that it is for the benefit of the undertaking. The strongest evidence, to my mind, in favour of that conclusion, with reference to Waterford, is afforded by comparing it with concerns of a similar kind in Ireland. I do not know one of the kind doing so well for itself as Mr. Anderson is doing for the Waterford Company.

Is there any company in Ireland where the statutory limit is 10 candles?—That would only prove the liberality of the company; they actually supply 15-candle gas, and when this Bill is passed the quality must be 14 candles.

What possible difference is there between the present agreement with Mr. Anderson and a lease of the gas-works?—Under a lease the consumers would have no benefit in increased consumption, but here they have. The more the consumption is increased the lower the price. I do not think there could be a lease for gas-works; but a contract, which I should call this agreement, is open to any company. I believe it would be perfectly legal for me to enter into a contract with the largest company in London.

How many thousand feet of gas would a ton of coal produce?—It is not what is produced; it is what is sold. The amount produced would depend upon how the coal was treated.

Say 10-candle gas?—Nobody knows anything about 10-candle gas; it has not been made in my recollection. If good gas is meant, it varies from 9500 feet of 14-candle gas to 10,300 feet of 13-candle gas. All gas engineers are in the habit of dealing with the gas sold. If I take 10,000 feet of gas, the cost of coal is 2s. per 1000, without deducting residuals.

The value of the residual products is, as a rule, about half the price of coal?—No; I deny that altogether. It is not a bad state of things when a third of the cost of the coal is returned—especially in country works—and it often happens to be less than that. As to comparing London with Waterford, it is merely a waste of time.

Are you aware that in 1875 the residual products of the Cork Gas Company realized more than 50 per cent. of the cost of the coal?—No; I was not aware of that; but I happen to know that there they manufacture their ammoniacal liquor into salts, which is an advantage many gas companies do not possess.

Whatever the amount that Mr. Anderson receives for residual products he receives it in addition to the price paid to him by the company for the gas?—Mr. Anderson receives the money he stipulates for as the price of gas to the company. He buys the coal, and pays for his labour and for the maintenance of the works. What there is in the shape of residual products belongs to him of right. It is a fallacy to talk of Mr. Anderson receiving these things.

Whether he receives or not, the money from the sale of the residual products goes into Mr. Anderson's pocket?—After the money for the coals has come out of the same pocket.

You have seen the depreciation account?—I have seen the word "depreciation," but it is a mere bagatelle whether it is called by the name of depreciation or any other name. Some companies write off from capital so much per annum on account of depreciation, which is altogether misleading. The proper way is to lay by out of profits, after the maximum dividends have been paid, a certain sum—generally about 1 per cent.—towards a reserve-fund, and out of that reserve-fund to make good anything which could not be kept up from year to year. All those things are made good by Mr. Anderson from time to time, as they occur. If an engineer was to be called in, and he was to say, in winding up the affair, "This roof requires renewal," Mr. Anderson would have to renew it. The company need not use the word "depreciation" at all. They ought to add to the reserve-fund, towards which they have a nucleus of £1000. It is the business of every company to get their reserve-fund full as soon as they conveniently can, and then they have always that to rely on.

I believe I am correct in saying that it is usual to allow 1 per cent. as a depreciation-fund?—One per cent. should be laid by—not written off—but absolutely laid by from year to year. The Gas-Works Clauses Act provides for that. Ten per cent. is what may be accumulated under the head of reserve-fund, and that, when invested, brings its interest and comes into the profit of the year, and if it has to be diminished it is made good again.

The one per cent. on the capital that is usually provided as a depreciation-fund is a charge on the revenue—it comes out of profits?—If there are any profits beyond the authorized maximum dividend, those profits may be applied, in the first instance, to the accumulation of a reserve-fund. If those profits should be 5 per cent. in any one year, they can all be put to the reserve-fund, so long as that reserve-fund is under 10 per cent. of the company's authorized capital.

Cross-examination continued: As to allowing for insurance, the companies may insure with insurance offices, and on some things they are insured at 3s. 6d. per cent. The rates vary for different forms of gas apparatus up to 10s. per cent., but the buildings would be done at 3s. 6d. If a company have an insurance-fund they become their own insurers, and they may put by what they like; there is no rule. No one would insure a brick tank which was sunk in the ground. Some companies do not think it advisable to insure at all.

Mr. FITZGERALD: Do you know of any gas company who have obtained an Act of Parliament since 1871, with which the Act of 1871 has not been incorporated?

Mr. MICHAEL: Dover, Brighton, and the Crystal Palace.

Witness: Yes; those are three.

Mr. FITZGERALD: It has been the practice since 1847 to incorporate the Act of 1847, and since 1871 to incorporate the Act of 1871.

Witness: It is the rule—it is prescribed in the Act; the Act says it shall be incorporated.

Can you tell me what quantity of gas the existing gas-works are capable of manufacturing?—They actually sell 30 millions; but I cannot remember what reserve power they have. The company say they are now putting up a gasholder because they want it; therefore, they have no reserve to fall back upon. I suppose they contemplate having 15 per cent. reserve power. I have not been to the works since the last arbitration, two or three years ago. At that time the works were in good order, but they have been enlarged since then.

Re-examined by Mr. RICHARDS: All the extensions during the last few years have been made through an unwise kind of—I will not call it parsimony, because it has been entirely unselfish—but an unwise policy. They ought to have come to Parliament and capitalized £2000 or £3000 without waiting until they had spent £7000. That is a sum which they have laid out, and received nothing for during all the time it has been so laid out. It ought to teach the directors a lesson to come for fresh capital, upon which they may earn a dividend, as that capital is wanted. That is the only sound way for a gas company to carry on their business—let the capital be found for whatever extensions are required, and go on in that strictly straight line. The increase of consumption at Dover is not due to the increase of population there. I do not know that the population of Dover has increased at all; it is a place where steamers arrive and depart, but the fixed

population of Dover undergoes very little change. I am aware that under the agreement the dividend there has increased from 5 per cent. to 10 per cent. The agreement under which Mr. Anderson works at Dover is precisely the same as that under which he works at Waterford.

The COMMITTEE: When you looked into these accounts at the time of the arbitration did you satisfy yourself that this sum which was advanced out of profits—that is to say, which might have been applied to dividends—was strictly applied to works that might have come out of capital?

Witness: Yes; I saw how it had been applied—purifiers, engines, and retorts. I made an exhaustive inquiry. My co-arbitrator was a shipowner, interested in the town, and Mr. Vernon Harcourt was the umpire; therefore it was not a matter I had an opportunity of treating in a careless way. My impression, from a thorough investigation of the accounts, was that it was a very straightforward, honest case, and my co-arbitrator coincided with me. The award was signed by all three, although it need not have been signed by the umpire. We gave the company a greater price for the public lamps than they had asked for, before they went into arbitration, basing it upon established principles. We found they had spent money upon which they had paid no dividend.

If it was suggested that the restrictions of the Act of 1871 should be put into this Bill, and 14-candle light was made obligatory from the date of this Bill, it would not in fact affect the agreement between the company and Mr. Anderson, the date of 1886 having been put in because that was the date of the agreement ending?—It might—it might give Mr. Anderson a legal claim to a higher rate per 1000 feet. The consumers are quite secure that they will get the quality they have hitherto had. Mr. Anderson has no claim for any improved quality, but if you put the obligation upon the company to supply 14-candle gas, then Mr. Anderson or his executors might found a claim upon it for an increased rate per 1000. Therefore, upon that ground, I would say, let it be.

Practically the consumers get 14-candle gas now?—They get above 14-candle gas; that is the natural produce of the coal they use.

But they need not always use those coals?—Mr. Anderson has other works and has his credit to maintain, and he would not be seen making 10-candle gas. He would have it thrown in his teeth, and he would not get the residual products from other coals that he would get from those coals which he uses. The tar they would yield would also be poor; therefore there is really security for the consumer being treated well as the thing stands.

Supposing Mr. Anderson was to die, and his executors to carry on this contract; they might be glad to do it, and, having no reputation to support, they might reduce the illuminating power of the gas to 10-candles?—It would be void on his death—the executors could not carry on such a business.

Mr. RICHARDS said that was the case for the promoters.

Mr. FITZGERALD expressed his surprise at the promoters concluding their case without any witnesses from Waterford being called, or any person who could have given evidence upon the Bill of 1858. He therefore asked that the original Bill, as deposited in that year, should be produced, so as to enable him to point out to the committee the clause as it then stood, giving power to the company to lease their works, which clause was struck out by the committee as being an improper one. He should also submit to the committee that the agreement was, to all intents and purposes, a lease, though called an agreement.

The CHAIRMAN said there was no reason why that should not be done, as it was deposited in the Private Bill Office.

Mr. FITZGERALD said he would call his witnesses before addressing the committee.

Mr. *William Howard*, examined by Mr. FITZGERALD.

I am town-clerk of Waterford, and appear here as the representative of the corporation, who have the duty cast upon them, under the Municipal Act, of lighting the city, in which position they are the largest consumers of gas in Waterford, and have a direct interest in the price of gas and the management of the gas company. The corporation are of opinion that if the capital of the company is enlarged as proposed it will put an effectual barrier against ever reducing the price of gas to the consumers of Waterford, where the price is higher now than in towns similarly situated. During the last ten years there has not been such a large increase of consumption as to require the capital of the company to be doubled. The corporation also object to the Act of 1871 not being incorporated. They are of opinion that the power which that Act gives for testing gas, and also for having a full statement of the accounts, would be very beneficial for the gas consumers of Waterford, because it would enable them to investigate the accounts of the company, and see how far they would be entitled to a reduction in the price of gas at any time. The accounts as lodged at present are simply fallacious; they give no information about the profits made upon the manufacture and sale of gas at Waterford. The corporation have several times applied to see the agreement made with Mr. Anderson, but have been unable to do so. Under the Gas-Works Clauses Act, 1847, the company are bound every year to deposit a statement of their accounts with the clerk of the peace, but up to 1874 no such accounts were ever deposited. We inquired for them, but the clerk of the peace said he never received them. We then took proceedings to procure a lodgment of them, and three accounts have been lodged, copies of which I have here; but in the judgment of the corporation they are altogether illusory. There is no statement of the amount of coal consumed, nor the amount of gas manufactured, nor the produce of the sale of residuals, nor the other statements which appear in gas accounts. In 1874 the company presented a similar Bill to the present, applying for an increase of capital of £8000, with the usual borrowing powers of 25 per cent., but the night but one before the hearing was fixed, they withdrew the Bill. A gasholder is at present in process of erection on ground not the property of the company; it is outside the limits as defined by their Act.

Cross-examined by Mr. RICHARDS: We did not apply for an injunction to stop the company from erecting that gasholder, but I cannot say why we did not. I consider the words "works for the manufacture of gas" in the company's Act of 1858 include gasholders, because I think a gasholder is appurtenant to the manufacture—it is part and parcel of it.

Mr. RICHARDS: Observe what section 5 of the Act 34 & 35, Vic., cap. 31, says: "The undertakers shall not manufacture gas or any residual products, except upon lands described in the special Act, and they shall not store gas except upon those lands without the previous consent in writing of the owner, lessee, or occupier of every dwelling-house situate within 300 yards of the limits of the site where such is intended to be stored." Do you not see a clear distinction drawn there between manufacturing and storing gas?

Witness: Yes; that was in the year 1871, though, which does not apply to this company at all.

Your argument is, that though in the year 1871 the storing of gas was distinguished from the manufacture of gas, in the year 1858, the storing was part of the manufacture?—It is appurtenant to it. The company have not obtained the consent of the inhabitants as prescribed by the Act.

You say a gasholder is part of the manufacture of gas?—Yes. There must be a place to put the gas when it is made.

What is it the corporation want? Do they deny that the company have expended £6000 and odd out of their profits which they might have divided?—No; we do not deny that, but I do not think we have received any benefit from it, so far as I am aware.

Has not the town received the benefit in their gas supply?—The town has paid for the gas, and I do not call that receiving a benefit. We believe that the company and the contractor have divided between them a great deal more than 20 per cent. instead of 10 per cent.

At present you have not proved that, and we deny it. If the auction clauses are introduced, what does it signify how much capital the company ask for?—It does signify, because, if capital is created, it will necessarily involve annual expenditure in the way of dividends.

Supposing the shares are at a premium?—When the shares are at a premium of course the public get the benefit of that.

If they are at a discount, there is no great temptation to offer them?—No; I suppose not.

Cross-examination continued: I do not know that we have opposed the Waterford Gas Company very much; their Bill was opposed in 1858. I know that the company originally supplied the public lamps at £3 15s. per annum, but they have been continually seeking to raise the price. I am also aware that on an arbitration the price was fixed at £4 9s. 8d. That contract expired in 1874, and again the corporation went to arbitration. The company at that time demanded £5 19s. per lamp, and the arbitrators gave them £4 8s. 6d. I think we offered them £4 before the arbitration. Thinking the price of gas at Waterford was higher than it ought to be, I sent for information to other places, where the circumstances were similar; but there are few places so favourably situated as Waterford. I do not know anything about the manufacture of gas myself, but I do not think the accounts of the company comply with the Act of 1847. I forget whether I have made any personal application to see the agreements.

Mr. RICHARDS: So far as I understand, you have made one application, and that was in the House of Commons in 1875, upon the occasion of the City of Waterford Improvement Bill.

Witness: It was not in connexion with that Bill, although it was at the time the Bill was before the committee. Of course Mr. Nagle had not the agreement with him, although he was Mayor of Cork at that time, and was examined in favour of the Improvement Bill.

Re-examined by Mr. FITZGERALD: Mr. Strange is the solicitor to the corporation, and he has applied more than once.

Mr. RICHARDS: If Mr. Strange has done that he can come and prove it.

Witness: For anything I know, a copy might have been applied for by Mr. Strange.

WEDNESDAY, JUNE 6.

Mr. *Joseph Fisher*, examined by Mr. FITZGERALD.

I am a member of the Corporation of Waterford, and have given considerable attention to the gas question in that city. The original works were held by a private company, but in 1858 an Act was passed for the formation of a new company, and Messrs. Anderson and Jones have been since then generally regarded as the lessees of the gas-works. I think the existing works could double the supply, with the exception that they want an additional gasholder. The present capital of the company—£20,000—entails upon the consumers a burden of £1800 per year.

By the COMMITTEE: The parliamentary payment of 10 per cent. upon £16,000 is £1600 a year, and 5 per cent. upon £4000 borrowed is £200; and if the capital is increased that burden will be increased. The £1800 a year adds 1s. 4d. per 1000 feet to the price of gas, and if the company obtain the extra capital they are now seeking it will add another 1s. per 1000 feet to the cost of the gas, which in some way or other will have to come out of the pockets of the consumers. As I understand, the B shares will be issued as bonuses to the existing shareholders, in the proportion of one share to every four; but the company will not get a farthing of capital for these B shares, although they will charge the citizens of Waterford £200 a year.

Examination resumed: In 1874 the price of coals was so high that the company's profits were not so large, and I think there is less necessity for an increase of capital now than there was then.

Mr. FITZGERALD: In 1874 the corporation proceeded against the company for not lodging their accounts, and the company were fined £20; but have the back accounts ever been lodged, or have the corporation ever been able to get those back accounts furnished?

Witness: When we were in London, in 1874, we asked the solicitor of the company whether the accounts were lodged, and he said they were. We then telegraphed to Waterford, and the reply was that they never had been lodged. We then took counsel's opinion, and were advised that we could not go back more than six months, and we therefore allowed the matter to drop. In January, 1875, we took proceedings, and the accounts were lodged in April. I think there has been an attempt made to mislead the committee with regard to the accounts which have been handed in. It is very true that the directors prepare accounts to give to the shareholders, but they will not publish them, nor allow the public to see them—neither are they the accounts required by Act of Parliament. According to the accounts for 1876, the sum of £5359 was paid to Messrs. Anderson and Jones; but, in addition to that, they would obtain the residuals, which would amount to about £2200, and do not appear in the accounts at all. Those residuals are equal to 1s. 6d. per 1000 feet of gas made. The committee have been told that the lessees were getting 3s. 2d. per 1000 feet, which, on 30 millions, would only be £4813, while Messrs. Anderson and Jones were paid £5359. I, however, deny that there were 30 million feet of gas made. In the accounts there is put down for public lighting £1605, which includes 18s. 6d. per lamp for capital and for lighting the lamps.

Mr. FITZGERALD: Can you form any estimate—although, of course, it must be a rough one—of how much profit Messrs. Anderson and Jones would make out of this sum of £5359, taking into account that they would receive the produce of the residuals as well?

Witness: According to the Cork accounts, if the residuals are deducted the price of gas there is 2s. 7d. per 1000 feet, and putting in the extra items which appear in the Waterford accounts, besides Messrs. Anderson and Jones's profit, the price of gas in Waterford last year was 4s., so that there was 1s. 5d. more paid for gas in Waterford than in Cork. I think probably if you allow 1s. per 1000 cubic feet for Messrs. Anderson and Jones's profit on 30 millions, it will amount to £1500 a year, which would be between 9 and 10 per cent., in addition to the dividend. The consumption of gas appears to have been calculated by multiplying the gas-rental by 4s., and in that way 30,800,000 has been arrived at. I have here the actual quantity given in evidence by Mr. Jones for 1874, which was 27,853,000 cubic feet. Of that quantity 6,145,000 cubic feet were for lamps, and 21,708,000 for private consumption.

Mr. FITZGERALD: Immediately after this company were formed, and a certain amount of capital was laid out, there was a large increase—between the years 1858 and 1861 or 1862—in the consumption of gas, but since that time the increase has been very gradual indeed, has it not?

Witness: There was a part of the city, called Ballybreccan, which had not been lighted before, and one reason for getting additional capital was to lay down mains and light that part of the city; but since that I do not think there has been a serious increase in the consumption of gas. In 1862 the company proved to the arbitrators that their income was £5793,

including, I think, the public lighting, and they were then making 25,873,000 cubic feet. In 1868 there were 322 public lamps paid for, and in 1876 there were 329, so there has only been an increase of seven public lamps in that period. So long as the company supply 10-candle gas we can make no complaint against them. The gas was very good when the arbitrators were in Waterford in 1875; but that is not always the case. I do not think it was 10-candle gas last week. Mr. Spice gave the committee to understand that the gas was made from a particular kind of coal; but the import lists of Waterford show that the gas company get a very large quantity of inferior Welsh coal. Waterford is a town easily accessible from the Welsh collieries; the coal can be put from the barges into the works at once. I am of opinion that the price of gas in Waterford at present is unreasonably high. There is another item which has not been mentioned before this committee, but which enters into the question of price very largely, and that is that there are no municipal taxes in Waterford, and the saving of taxes on the gas-works there, as compared with Limerick, is about £300 a year, and that is an element in the price of gas. The Limerick rates are £546 in one year, and in Waterford I do not think the whole of the taxes amount to that sum. There are only two rates in Waterford—a poor rate and a county rate; there is no improvement rate or borough rate, or any tax of that kind.

Mr. FITZGERALD: In addition to the powers of dividend by this Bill, the company will be empowered under their present Act to pay any back dividends amounting to 10 per cent,, and they would be entitled to divide the surplus profits for that purpose?

Witness: Yes.

Under these circumstances, if this Bill passes, is there any reasonable hope of the price of gas being reduced in Waterford?—I think that the price of gas must be increased. If the company are going to have £44,000 given them instead of £20,000, where are the profits to come from but from the consumers? The only item that I can see they can look to is the £50 for directors remuneration, but they have no right by Act of Parliament to those fees, and they have been taking that £50 for 18 years.

This company of directors and the shareholders of the concern have no connexion of any sort with Waterford, have they?—No. There is no confidence in them in Waterford at all. I do not think there is a man in Waterford who would put any money into the concern.

The directors and nominal officials all reside in Cork, and of the practical managers, one resides in London and another in Dover?—The Waterford consumers have to pay the whole staff. There is a staff at the works and the managers there; and then there is Mr. Anderson's profit; and then there are the directors to be paid; and then there is the dividend; and the price of gas is, therefore, not what I think it ought to be.

Cross-examined by Mr. RICHARDS: Cork is a great deal larger than Waterford, but I do not think they have the misfortune to have alien directors there. I should think the consumption of gas at Cork is 170 millions. I remember the Bill of 1858 when I was a witness for the question, but I do not recollect that the price proposed by that Bill was 6s. 8d. per 1000. The corporation would have objected to that price, but I do not think I was asked a question about it.

Mr. RICHARDS: What photometer do you use when you test the illuminating power—Sugg's or Letheby's, or whose?

Witness: I think my eyes are the best means of testing.

When you talk of the gas having been last week 10 candles, and probably 15 when Mr. Spice was there, were you judging by your eyes?—I had to get a candle to give me sufficient light to write with.

You think that your eyes are better than a photometer?—A photometer will give you the exact quantity, but any man can judge whether the gas is of a good illuminating power when he comes to use it.

You complain of the salary of the directors, which has been proved to be £25 every half year?—I do not think it is legal, because it is not in their Act of Parliament.

You say there is nothing in their Act, will you tell me whether the companies Clauses Consolidation Act is not incorporated with the Waterford Gas Act of 1858?—It is so.

Then, if that is so, there is clearly power to remunerate the directors?—I differ from you upon that.

Cross-examination continued: I do not think they are acting so illegally in Cork, because there they have a special Act. The auction clauses were not originally included in this Bill, although they are now inserted.

Can you conceive any possible interest the directors can have in issuing capital under the auction clauses, unless they absolutely require it?—I do not think that makes any difference. I do not think that these shares would command any premium if they were placed in the market without the auction clauses. When the concern is loaded with £4000 of B shares, I think you will find the price will go down, and that there will be no premium upon the capital.

Then what inducement could the shareholders have to issue capital unnecessarily?—Why, then, do they come to Parliament for the power?

Because they have no money. What is your proposition? Is it that they shall stay without money at all?—I do not see anything that they want additional capital for, except what should be provided for out of the depreciation-fund of one per cent.; and with regard to the new gasholder they are going to build, they ought to have had money in hand to do that with, if they had kept their affairs in the way the other companies do.

Do you mean to say that the capital is to be increased out of the depreciation-fund?—No; I say that the depreciation-fund, in the case of other companies, is accumulated year after year, and when a new gasholder is wanted they have the money to pay for it.

If they want to extend a new main and to erect a new gasholder, not in lieu of an old one, but a new one—out of what fund is that to come?—In my judgment it should come out of the depreciation-fund that they should have put by every year. A gasholder will only last generally 25 years, the company have been 18 years in operation, and they ought to have as much money in the depreciation-fund as would enable them to get a new gasholder. They do not want, I think, new capital for that.

Where does the depreciation-fund come from?—From the consumers of Waterford.

That is out of revenue?—Yes.

You would not recommend that the capital account should be increased by expenditure out of revenue?—Decidedly not.

You propose that the gasholder should be constructed out of a fund which is to come out of the consumers pockets?—I do not propose that. I am merely telling the committee what takes place with regard to other works, and my judgment, as far as I can form it, goes to the same thing.

Therefore, you would have the consumer pay for the construction of new works by money that comes out of his pocket?—If you get the capital, he will pay interest upon that, and is it not precisely the same thing? If you raise £4000 additional capital at 7 per cent., there will be £280 a year, and where else can you get it but out of the consumer's pocket? You want to load the consumers with everything.

Is there no difference, think you, in the consumers finding the capital, or providing the interest upon that capital, as that capital is gradually expended?—If the depreciation-fund is £200 a year, there is 1 per cent. upon the structural works, and then there is the capital that you intend to raise at 7 per cent., and the consumer has to pay £280 a year interest; is it not exactly the same?

Is there any difference between the consumers finding the capital, or simply paying interest upon the capital as it is invested?—I do not consider that the consumer finds the capital in any case. Whichever way it is done, you put the load upon the consumer, and that is what we object to.

Cross-examination continued: The Act of 1847 requires the company to give an account of all their receipts. The company's own Act gives them power to sell the coke and other things made at their works, and they have either been sold to Mr. Anderson or disposed of in some other way, but there is not a penny brought into the accounts for them. I consider the agreement between Messrs. Anderson and Jones and the company to be a fraud upon the public, and the reason I say so is this—a clause was put into the Act of 1858 giving the company power to lease the works, and Parliament struck out that clause, but notwithstanding that, under the articles of agreement, the works have been handed over, which is virtually a lease, and what has been done? All the provisions of the Gas-Works Clauses Act, with regard to the 10 per cent. and the reduction of price, are got rid of. The company may make a lease to their own shareholders—as has been done, because Messrs. Anderson and Jones are both shareholders—at such a price that it would not leave them 1 per cent. dividend, they have actually, I believe, made away with 10 per cent. of it. I am not aware that the same agreement exists at Dover.

Mr. RICHARDS: Do you know that the Dover Company had a Bill before Parliament a short time ago, and that no objection was taken to that agreement with the same gentleman—Mr. Anderson?

Witness: Was there not an objection taken this session to a similar agreement, and did not the committee rule that the profits of the contractors should be counted with the profits of the directors or shareholders in making out the 10 per cent.? I am informed that with regard to the Mr. Jones in this case—or a Mr. Jones with an agreement of this kind—another committee said that he was not to put the profits into his own pocket, but that they must be brought into the common accounts, and accounted for to the public.

When the Act of 1858 was passed, were the shares offered in Waterford?—I think they were offered privately, but not to me.

Cross-examination continued: The first time my attention was called to the depreciation account was by Mr. Jones, when he was examined on oath before the arbitrators at Waterford. He stated that Messrs. Anderson and Jones, as the lessees, were bound to keep the premises in tenantable repair, but he said beyond that there was structural depreciation constantly going on, which I think he said was 2 per cent. per annum, which ought to be put aside out of profits to meet that, and he stated on the document he handed in there was "no allowance in the above for depreciation or insurance." [Document handed in.]

Mr. RICHARDS: You admit, I presume, that during the several years mentioned the company were at liberty to pay their full dividend if they could?

Witness: They had no dividend until they provided for the depreciation of their plant.

That is wear and tear?—No; the wear and tear of works and retorts is put down at £626, and of meters and mains £155, and then comes the remark I have just mentioned. That is your own evidence.

Re-examined by Mr. FITZGERALD: The gentleman best qualified to give information with regard to the affairs of the company, or as to the manufacture of gas in Waterford, is Mr. Anderson, but he has not been called as a witness.

By the COMMITTEE: With regard to the coals delivered at the company's works, I merely saw the vessels that had come in from the shipping lists; I never kept any account. I should fancy the company used an equal quantity of Welsh and Newcastle coal, but I cannot give any positive information.

Do you mean to say that at the time of Mr. Spice's visit to Waterford the quality of the gas was markedly different from what it is now?—I considered it so. We had a gentleman down from Dublin as a witness for the corporation, and he was struck with the good quality of the gas, and said that if we were getting such good gas as that we were very well off.

Mr. BONHAM-CARTER: Do you still make a complaint against the quality of the gas?

Witness: It is always, I think, above the quality of 10-candle gas, but last week it was exceptionally bad, but I did not make any complaint. An allusion has been made to its being as good as 15 candles; but I should not like the committee to believe it is always anything near that.

Whence do you derive your experience with regard to gas companies, and the practice of gas companies in the matter of accounts?—Before I came to Waterford the gas-works in the town that I was born in belonged to the commissioners representing the Corporation of Youghal. It was a small concern, and I was on the committee of management, and took some interest in it, and when I came to Waterford I was consulted a good deal about the matter.

With regard to the increase of capital, and the consequent burden upon the consumers, does it not strike you that the capital would not be laid out unless the company saw, from an increased supply, an increase of dividend?—I do not think that is the eventuality which will arise. If we had an increase of population, or an extension of the city, it would make a great difference, but Waterford is at present at a standstill; there are no new houses being built there, and there is nothing to require it. The only thing I see as to there being any chance of an increase of gas is using gas-engines.

By the COMMITTEE: I suppose the difference in price between Welsh coal and Newcastle coal would be about 5s. or 6s. a ton at Waterford.

Mr. *Hugh Nevins*, examined by Mr. FITZGERALD.

I am secretary to the Harbour Commissioners, who pay for 52 public lamps. My objections to this Bill are that I do not think there is any necessity for an increase of capital, on the ground that, though Waterford is improving as a town, the gas-consuming population is actually decreasing; for, as people get able to do it, they go to live at the seaside and in the country, and those who remain behind are not gas consumers. That acts in a double form, because, as people go to live in the country the more important customers to the shops leave the town earlier than previously, and, consequently, the shops are shut earlier than they were some years ago. I also object to the capitalization of any proportion of that £6700, on the ground that the chairman has stated that at one time this was written in the account as "Improvement of works," and after a certain time it was changed from "Improvement of works" to "Depreciation." I know, not perhaps personally, but by reputation, that the parties connected with this company are clever and reasonable men, and, therefore, I have come to the conclusion that they must have had some very good reason, or they would not have changed it from "Improvement" to "Depreciation." There is a further objection on the part of the public—and I am speaking individually, as one of the public—with respect to the form of accounts; and, without raising any question as to whether too much or too little is paid to Mr. Anderson for making the gas, I hold that the public have a right to know the cost of coals, and the cost of labour and superintendence, and the amount received for the residuals, in order that they may ascertain whether the amount Mr. Anderson receives for

his professional services is larger or smaller than what he ought to receive. Those are the principal objections I have individually to the provisions of the Bill. The price of gas is lower in Waterford as compared with other seaport towns. The charges on colliers are lower than on any other class of vessels, and the freights to Waterford are reasonable. The tonnage dues are also less, and there are no town dues on coals. In Limerick the charge is £3 6s. per lamp; in Queenstown, £6 per lamp with two burners; while in Waterford the charge is £4 per lamp with one burner.

Mr. *Lawrence A. Ryan*, examined by Mr. FITZGERALD.

I am an alderman of Waterford. I have heard the evidence given with regard to the increase of capital, and quite agree with it. I have been a member of the committee who have had this matter in charge, and we went into the thing very fully, and I believe that neither the committee nor the corporation would oppose an application for additional capital if they saw any grounds for it, but we do not see how they can supply any more gas than they supply at present. The corporation also complain very much about the agreement, because by the Act of 1858 the company are only allowed to divide 10 per cent., but that agreement—whether it is a lease or agreement—has the effect of enabling them to pay perhaps 20 or 30 per cent., which is an evasion of the Act of Parliament.

Mr. *Spice* was recalled, and handed in a statement of the money expended on extensions of works from 1868 to the end of 1874, which amounted to £2957 16s. 9d. Witness also stated that he wished to make a correction in the evidence given by Mr. Howard on the previous day, when he stated that "the company, at the arbitration, demanded £5 19s. per lamp, and the arbitrators gave them £4 8s. 6d." In justice to the company, it ought to appear that the company only asked £4 4s., and £4 8s. 6d. was awarded, showing that the company were moderate in their demands.

Mr. BONHAM-CARTER: What is the price per 1000 feet which, under this agreement, is now being paid to Mr. Anderson?

Witness: I believe it is 3s. It appears to be 3s. in one way, but the net result is 3s. per 1000 feet.

The COMMITTEE: Is there 12s. a lamp allowed in addition?

Witness: That 12s. a lamp is charged by the company for the services of lighting and maintaining the lamps, and a small sum for interest upon the capital.

What is that paid to Mr. Anderson for?—For the services he renders to the company. The reason is that the gas is charged at a lower price for the public lamps.

Mr. *Howard* was recalled, and in reply to Mr. FITZGERALD he stated that at the sitting of the arbitrators the case for the company was that they ought to get £5 1s. 9d. (not £5 19s., which was a mistake). No doubt before the arbitration the company offered to take £4 4s., and they were offered £4. That claim was contested, and the arbitrators gave them £4 8s. 6d.

Mr. RICHARDS: You forgot to mention the £4 4s. yesterday.

Mr. *Spice* was again recalled, and stated that he obtained his figures from the books of the company, and he had gone through the various items.

Mr. FITZGERALD then addressed the committee in support of the petition of the Corporation of Waterford, and,

Mr. RICHARDS having been heard in reply,

The room was cleared. After some time the counsel and parties were called in, and

The CHAIRMAN said the committee were prepared to pass the preamble of the Bill, subject to the following alterations, viz.:—That the provisions of the Gas-Works Clauses Act, 1871, should come into operation at once; that the illuminating power should be 14 candles at least; that the B shares asked for in clause 4 should be £2000 instead of £4000. The additional capital asked for by the Bill would be granted, and the question of price and also of the sliding scale would be considered.

Mr. FITZGERALD said he would not further occupy the time of the committee.

In reply to Mr. MICHAEL, the CHAIRMAN said it was the intention of the committee that the sliding scale should be inserted.

Mr. BONHAM-CARTER: It will, however, be open to the promoters to give reasons to the contrary.

THURSDAY, JUNE 7.

The clauses were this day proceeded with. On arriving at the one relating to the sliding scale, the following evidence was called:—

Mr. *R. P. Spice* recalled, and examined by the COMMITTEE.

My view of the sliding scale is, that unless the matter is dealt with liberally by parliamentary committees, the consumers will not get the benefit from it which it has been anticipated and designed that they should. The object of the auction clauses is, that a portion (and it may be a considerable portion, according to my experience in connexion with gas companies) of the capital shall be derived from premiums which bear no dividend at all. If the price is fixed so low that the general public will not have faith in the maximum dividend being earned—that is to say, the dividend allowed by the Act being earned—then they will not buy shares at a premium, and the consequence will be that the price of gas will have to be kept up above what it need be, because all the capital has to be paid for in the shape of dividend. Therefore, parliamentary committees will do well and wisely to be liberal with gas companies, because that liberality is felt by the consumers. The gas company may get their maximum dividend, and when they have got that, that is all that will be done, and the price of gas will not be reduced. Give the company an opportunity of earning one-quarter per cent. for every penny, and it will be earned, but it cannot be earned unless you allow them a little margin. It must also be considered that, if you deprive the company of the maximum price, you take away from the company the marginal price which has always been considered to cover the risk of a coal famine, or a great increase in the price of material generally; therefore, there is that to be allowed for, and there is to be given to the company a chance—that is, a fair prospect, which the public will estimate for themselves, of getting a maximum dividend. It was upon these principles that the Croydon Company, who, the other day, were selling gas at 4s. 3d., were allowed 4s. 7d., and the Carshalton Company—and I name these two as being near London—who were charging 5s., were allowed 5s. 10d., because their capital was such, as compared with Croydon, that they required another 6d. or 8d. per 1000 cubic feet, to pay the maximum dividend. In the case of Londonderry, which was fought out the other day, after a very severe opposition from the corporation—and, therefore, it was not a thing that slipped through—it was proved that they required 5s. 9d. to pay their maximum price. It seems to me that 5s. 3d., or 5s. 4d., according to my calculation, would pay the maximum price at Waterford upon things as they stand, but how do they stand? The company are now building a gasholder; they have built, I believe, the tank, and they have certainly to spend £5000 or £6000 at once, and the whole thing will be disturbed, and, therefore, less than 5s. 7d. will not pay upon the state of things that will exist within twelve months from the passing of this Bill. Therefore, I say that, although 5s. 9d. is the proper price for Londonderry, 5s. 6d. would be the least that, according to my judgment, should be fixed for Waterford, in order to enable the consumers to have a chance of getting the price of gas reduced. The standard price in the Bill, as the discount stands, is 6s. The price charged, and to be considered in applying the sliding scale, is in round numbers 5s. 1d. There is never any improvement upon that state of things to be expected in Waterford; but let the company have a chance, and the consumers will get the benefit of the sliding scale. That price of 5s. 1d. is of no use to anybody. Therefore, I think that the discount ought to be struck out of the old Bill, and a fair standard price put in, and I suggest that a fair standard price is 5s. 6d.

The COMMITTEE: You are aware that without the compulsory discount, in the case of Limerick, we made 5s. the standard price?

Witness: Yes, you did; but then there is a state of things which is very unenviable indeed. Limerick is twice the size of Waterford, and the residual products are worth much more than they are in Waterford. Then, again, there are two concerns at Limerick, producing about 30 millions each, but in Waterford, there are only 30 millions sold altogether, and that is a very material element in considering the fair standard price.

Do you not consider the compulsory discount, in producing prompt payment, an advantage?—That would still be left in the discretion of the company, but they are not obliged to consider that before they can increase or lower the price. I have made a calculation with regard to that, to submit to you. It will be within the power of the company to offer that inducement for prompt payment, and I would suggest that they should offer 10 per cent., and to do that, the net would be 5s. 4d., taking all things into consideration; and 10 per cent. discount for prompt payment would give the company 5s. 4d. from 6s. If you say 5s. 6d., it will be better. Then that 5s. 6d. per 1000 feet will leave them to give what discount they like. That is a very necessary thing for a company in a place like Waterford, where they have a large proportion of not very well-to-do customers.

The price should be 5s. 6d., with an optional discount, you think?—Yes.

Mr. RICHARDS: I understand Mr. Spice to suggest the price of 5s. 6d. without any discount. I am assured by those connected with the city of Waterford, that the discount system is one which, in point of fact, does give satisfaction—it is something that they are used to—something that has always existed. And another thing is, that our opponents are not here at present, and the question is, whether it would not be better, on the whole, to preserve the old price with the old discounts, rather than put another price without discounts. When we reach another place, we should possibly create an ill-feeling, because it might be said that we had got the price altered behind their backs, and so on, when the opposition was withdrawn. Therefore, I really think that the original proposition of maintaining the old price with the old discount would be the best.

The CHAIRMAN: Would not your opponents object to the price being altered in another place?

Mr. RICHARDS: No, but we should object most strenuously to the price being lowered. As I understand, Mr. Spice's proposal is not to lower the price, but to give a uniform price of 5s. 6d., and not to have a discount that is more favourable to the consumers.

The CHAIRMAN: Mr. Spice's calculation is founded upon a discount of 10 per cent.

Mr. RICHARDS: Then if that be so, the thing is quite as favourable; the old discount will work out quite as favourably.

Mr. BONHAM-CARTER: Is the discount, the statutory discount as at present, under the Act of 1858?

Mr. RICHARDS: Yes, it is the statutory discount. I cannot help thinking that if you make any alteration at all, it will be better to make a uniform one of 15 per cent., and let the old price stand at 6s.; I think that would simplify matters. Any alteration of price which might be obtained in this case, when our adversaries have left the room, always creates suggestions of bad faith, and, therefore, I earnestly ask you to leave the price at 6s., with 15 per cent. discount.

Mr. BONHAM-CARTER: What has been the ruling price at Waterford during the last ten years?

Witness: There is a very small proportion of consumers who receive the benefit of a 20 per cent. discount.

Mr. RICHARDS: The ruling price has been 6s., and at one time it was 5s. 9d.?

Witness: Yes.

And of course that is a sum that has varied with the price of coal, but it has been 6s. during the larger part of the time; in fact, during almost the whole of the time?—Yes.

The CHAIRMAN: The committee have decided that the clause with reference to the sliding scale shall stand part of the Bill.

The clauses of the Bill were read, and, amendments being made therein, agreed to.

The chairman was then directed to report the Bill, as amended, to the House.

CROFT AND HURWORTH-UPON-TEES GAS COMPANY.—The thirty-ninth half-yearly meeting of this company was held on the 6th inst. at which the directors reported that, during the half year to June last, the income was £410 16s. 5d., and the expenditure £226 3s. 10d., leaving an available balance of £184 12s. 7d., admitting of a dividend at the rate of £6 per cent. per annum, and leaving a balance of £64 12s. 7d. to carry forward to the reserve-fund, which would then amount to £173 17s. 11d. The consumption of gas was steadily increasing, and the mains in the village of Hurworth-upon-Tees had been enlarged, giving a much better supply of gas to the consumers in that part of the company's district. Extensions at the works were being carried out, which would enable the company to manufacture a much larger quantity of gas to meet the increasing demands of the district.

WEARDALE AND SHILDON WATER-WORKS COMPANY.—The half-yearly meeting was held at Darlington on Wednesday last Mr. Henry Pease in the chair. The directors report stated that there resulted from the company's transactions an available balance of £5068 3s. 11d., out of which a dividend of 4 per cent. was recommended to be paid. This left a balance of £374 17s. 3d. to be carried to the credit of next half year. The chairman moved the adoption of the report, and congratulated the shareholders on the prosperous state of the concern, notwithstanding the great depression of trade which existed in the district of their operations. He stated that during the past half year considerable progress had been made with the works at Tunstall, the embankment being now within 30 feet of the summit. This, it was expected, would be completed about February next. Pipes for the extension of supply were also being laid down in the Dearness Valley, and towards West Carnforth, Coxhoe, and other places. The Beechburn reservoir it was expected would be completed in the course of the approaching autumn, and the Mount Pleasant reservoir before the close of the year. The motion having been seconded, was carried unanimously. Mr. Hawksley, C.E., the consulting engineer to the company, was present, and, in answer to a question, said he considered the affairs of the company to be in a most satisfactory condition. Although they were paying one-half per cent. less dividend this year than last, it was easily accounted for by the depression of trade which existed at present. The works of the company were entirely to his satisfaction, and as to further extensions he thought them unadvisable in the existing state of trade.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

FRIDAY, AUG. 3.

(*Before the* MASTER OF THE ROLLS.)

THE CORPORATION OF BIRMINGHAM *v.* THE TALBOT COLLIERY COMPANY.

The plaintiffs in this action seek to restrain the defendant company from working their colliery in such a manner as to interfere with the corporation gas-works. When the motion last came before the Court, the defendants undertook not to go on working, the corporation giving a cross-undertaking as to damages.

Mr. CHITTY, Q.C., on behalf of the corporation, now sought to have both undertakings dissolved, on the ground that the corporation did not like to further jeopardize the corporation funds by continuing their cross-undertaking.

Mr. DANBY, Q.C., for the company, resisted the motion.

After some discussion, the MASTER of the ROLLS relieved the defendants from their undertaking, but said that the corporation must still be answerable for consequential damages. The costs of the motion would be costs in the cause.

EXCHEQUER DIVISION.

TUESDAY AND WEDNESDAY, JULY 31 AND AUG. 1.

(*Before the* LORD CHIEF BARON *and a Special Jury.*)

DAVEY *v.* THE CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

Mr. COHEN, Q.C., and Mr. ENGLISH HARRISON appeared for the plaintiff; Mr. CHARLES BROWN, Q.C., and Mr. MARTEN represented the defendants.

This was an action to recover damages for an alleged breach of an agreement, by which the defendants had contracted for a term of five years to sell all their surplus tar to the plaintiff, who was a pitch and tar distiller, in Gainsborough Road, Hackney.

The jury returned a verdict for the plaintiff—damages £334.

LIVERPOOL ASSIZES.—CIVIL COURT, TUESDAY, AUG. 7.

(*Before Justice* HAWKINS.)

GILLIBRAND, TRUSTEE, *v.* THE HORNSEY GAS COMPANY, LIMITED.

This action was laid for the purpose of recovering the sum of £175 1s. for gas coal sold and delivered, and the defendants paid £100 into Court.

Mr. POPE, Q.C., and Mr. JORDAN appeared for the plaintiff, Mr. Thomas W. Gillibrand, trustee of a firm named Hamilton and Co., colliery proprietors, Hoyland; and Mr. HERSCHELL, Q.C., and Mr. CROMPTON for the defendants.

The claim was for the value of coals delivered by plaintiff to defendants in July, 1876, under a contract entered into in the month of February, 1876.

The contention of the defendants was that they entered into a contract for best screened Silkstone gas coals, and that the coals supplied were not of the required quality. In consequence of the inferior quality of the coal, the defendants sought to deduct 8s. per ton from the contract price.

The jury returned a verdict for the plaintiffs for the balance of account, £75 1s.

SOUTHWARK POLICE COURT.—WEDNESDAY, AUG. 8.

(*Before Mr.* BENSON.)

OBTAINING GAS BY FRAUDULENT MEANS.

Moss Benjamin, a coffee-house keeper, of 11, St. George's Circus, was summoned by the Phœnix Gas Company for obtaining gas from them by fraudulent means.

The evidence on behalf of the company showed that the defendant had caused a small pipe to be introduced into the service-main in such a manner that the gas obtained by the small pipe did not pass through the meter. The company were not in a position to form an estimate of the quantity of gas thus obtained. The defendant denied that he had any intention to defraud the company, and said that he had employed a gas-fitter to make alterations in the fittings of the shop, and the pipe had been fixed without his (defendant's) knowledge of its position. The gas-fitter referred to said he fixed the pipe where it was found, by order of the defendant.

Mr. BENSON said in his opinion the defendant had prevented the meter from duly registering the quantity of gas, and he would be fined £3 and costs, which were at once paid.

HULL GAS SUPPLY.—Mr. Baynes reports that the gas supplied to the district of Sculcoates and Myton by the British Gas Company during the months of June and July gave the following results, sulphuretted hydrogen and free ammonia being at no time present to the ordinary tests:—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16·53	14·84	15·68
Grains of sulphur per 100 feet	31·50	26·00	28·44

Mean barometer 30·05; temp., 63°.

HUNTINGDON AND GODMANCHESTER GAS COMPANY.—The twenty-first annual meeting of this company was held on the 1st inst.—the Earl of Sandwich in the chair. The directors report stated that the receipts of the company had somewhat diminished, and on comparing the balance-sheets of the last three years there appeared little or no probability of increasing the business of the company inasmuch as most of the inhabitants of the two boroughs were consumers. By the exercise of great economy in the arrangement of the works, and having had no exceptional expenditure in the past year, the directors were able to recommend a remunerative dividend, and they thought the time had arrived for a further reduction in the price of gas, and recommended that it be reduced 5d. per 1000 feet from the 1st of September next. The balance-sheet showed the sum of £1464 3s. 10½d. available for dividend, and the directors recommended that a dividend of 8 per cent. be declared, free of income-tax—that £200 be added to the reserve-fund, and the balance be carried to the credit of the next year. The chairman made a few remarks on the report, and alluded to the present prosperous state of the company. He said he understood that an amendment was to be proposed that the dividend be 9 per cent., and he thought it would be unadvisable to adopt that course, as nothing could then be added to the reserve-fund. They had had a prosperous year, and now they had the opportunity they ought to adopt the same business principle of adding to the fund. The reduction in the price of gas recommended by the directors was equivalent to 2½ per cent. dividend; therefore if 9 per cent. was paid as dividend, either the price must not be reduced, or a small dividend must be paid next year. Mr. Foreman proposed that the dividend be declared at the rate of 9 per cent. He said this would absorb £1080, and there would then be £384 to carry forward, which was amply sufficient. The amendment having been seconded, it was pointed out how inimical it would be to the interests of the company if it were carried, and, on being put to the meeting, it was lost by a small majority. The reduction in the price of gas was agreed to, and the report was adopted. The price of gas will be 5s. 5d. per 1000 feet from the 1st of September. It appears that the price was 5s. 10d. from the formation of the company until 1868, when it was reduced to 5s., at which rate it remained until 1872, the year of the coal panic, when it was raised to 6s. 3d. In 1875 it was reduced to 5s. 10d. and now it is further reduced.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

METROPOLITAN BOARD OF WORKS.

At the Weekly Meeting of the Board, on Friday last—Sir J. M'GAREL-HOGG in the chair—a report was read from the Works and General Purposes Committee, which stated that they had received the report by Sir J. W. Bazalgette, Mr. F. J. Bramwell, and Mr. E. Easton, "Upon the best means of Providing an Efficient Supply of Water for Extinguishing Fires and for other purposes," in accordance with the resolution of the Board, passed on the 23rd of March last; but, as they had not been able to consider it, they recommended that it should be printed and circulated.

The following is the full text of the report:—

Westminster, May 9, 1877.

To the Works and General Purposes Committee of the Metropolitan Board of Works.

Gentlemen,—In accordance with the resolution of the Board, passed on the 23rd of March last, we now beg leave to make to you this our report upon the best means of providing an efficient supply of water for extinguishing fires and for other purposes.

We are sure that there is no need to lengthen this report by entering into a detailed statement of the proceedings of the many committees and commissions which, during the last half century, have considered how the provision of water to the Metropolis for the purposes of drinking and of fire extinguishing might be improved, nor need we do more than barely refer to Sir H. Selwin-Ibbetson's committee on the fire brigade, which is now sitting during a second session, and to the deputations to the Home Secretary on the subject of domestic water supply, to show that, notwithstanding the labours of the previous committees and commissions, and notwithstanding the improvements progressively made by the removal to places higher up the Thames and the Lea of the sources of supply, and by the establishment of better systems of deposition and of filtration, the public are still dissatisfied as regards potable water, and also as regards the provision of water for the extinguishing of fire.

The question of finding a satisfactory water supply for a town of only a few thousand inhabitants is frequently a very difficult one; but the magnitude of London and its situation, remote from large tracts of uncultivated and suitable catchment areas, enhance these ordinary difficulties to a degree for which there is no standard of comparison. The eight water companies that supply the Metropolis deliver a daily average of about 120 million gallons of water, and five out of these eight companies derive the whole of their supply from the Thames, while a sixth, by its new works, takes a portion of its supply therefrom, and obtains the remainder from the river Lea.

It is against the quality of the Thames water and of the Lea water that the complaints are made, and it is urged in support of them that the best system of filtration is, after all, but a palliative, and that even if it were more than this, it could not remove the knowledge of the fact that the water which is being drunk is derived from rivers that have received the sewage of a large proportion of the residents of the basins of the Thames Valley and of the Lea Valley above the intakes of the London Water Companies, as well as the drainage from the highly-farmed and manured surfaces of those basins.

It is often urged by those who object to the water supplied by the companies, that the Metropolitan Board, as the governing authority of the Metropolis, should acquire the water companies undertakings, and this is urged not only on the ground of effecting economy, but also under the impression that in some way or another the objectionable nature of the water is due to the default of private enterprise, and that if the supply were in the hands of the governing body, all ground of complaint would cease; but it appears to have been overlooked that there is the supreme difficulty of finding the requisite quantity of water of a quality that would be acceptable, and that, although the governing body could set about this work with the advantage arising from unity of action, nevertheless the physical difficulties would remain, and that nothing short of an enormous outlay could bring to London from Wales or from other, the nearest of the supposed suitable districts, the requisite quantity of unsuspected water.

Further, it must be remembered that the Duke of Richmond's commission, in their report, commented upon the undesirability of allowing large cities at a distance to appropriate for their uses water supplies which, if not now required, might hereafter be wanted for the growth of important towns in their more immediate neighbourhood (see paragraph 264): "That no town or district should be allowed to appropriate a source of supply which naturally and geographically belongs to a town or district nearer to such source, unless under special circumstances which justify the appropriation."

If the governing body of the Metropolis were, at a cost of from 20 to 25 millions of money, to acquire the existing water companies, it would find that this expenditure was merely a first step in the outlay, because the property purchased would be one wherein the bulk of the water would be drawn from the sources against which the public protests, and thus the £25,000,000 would have to be supplemented by a further, and, perhaps, an almost equal outlay, to replace this water by other, derived from purer sources, even if indeed it could be got at all.

But, assuming that it could be got, and that it could be brought to London in quantities sufficient, the fire question would still remain unsolved, because, unless at a most enormous cost, the water could not be brought into London at such a level as would give sufficient pressure for a proper fire service.

No doubt that which is to be desired is, the establishment throughout the whole Metropolis of the hydrant system, not, as has been suggested, merely to perform the functions of an improvement over the fire-plugs as outlets for water to supply fire-engines, but to act the part which fire-engines now play, and to be the means of throwing jets as adequate in quantity and in elevation for the extinction of fires as are the jets of the best steam fire-engines.

But, even if the expense of putting down the number of hydrants requisite for the whole Metropolis were incurred, this would not be sufficient by itself, nor would it be so if it were accompanied by constant pressure instead of by intermittent service, for the fact that the pressure may always be "on" will not convert that pressure from an inadequate one (if it be inadequate) to one that is suitable for giving a sufficient elevation of jet, neither will an apparent adequate pressure, shown to be so when no water is being drawn, supply the needful volume and height of jet, unless the whole system of pipes leading to the hydrant is such that, when the jet is set flowing, the reduction of pressure which must ensue to drive the water through the pipes shall be but small, and this not for one jet only, but for all the jets required to be brought to bear on a large fire. It is stated by Captain Shaw, in his evidence before the Fire Brigade Committee, that over 2000 gallons per minute are needed at a great fire. As to the difficulty of providing such a quantity, it is clear that in many localities certain of the companies could not concentrate at the site of a large fire this 2000 gallons per minute, even if delivered at the street level, to be raised by fire engines; and it is almost certain that, except in a few favoured situations, no company could supply this quantity when

the rate of delivery was reduced by all the effective head or pressure required to produce the jet.

To meet the fire requirements, therefore, there would have to be the further outlay for a large revision of the system of pipeage over the greater part of the Metropolis.

Our experiments at Grays show that, to give the necessary force to throw the quantity of water before stated to a sufficient height, to meet the demands of one of these large fires, the water supplying the mains must be pumped to an elevation of not less than 350 to 400 feet above the Thames, while as regards the pressure given by the water companies it must be borne in mind that the statutory obligations upon the different companies as to the pressures to be maintained are very various, and in many cases this pressure is but small. As an instance. With respect to one of the largest companies, the height does not exceed 40 feet above the pavement. In the district of this company there are lofty warehouses belonging to our most important docks. Other companies are bound to maintain, or do maintain, a considerably higher pressure than this, but, in order to provide the pressure requisite for an efficient fire service, the water of the various companies would have to be raised from the height to which at present they are bound to raise it, to the 350 or 400 feet we have already mentioned. This would involve an annual extra expense of pumping stated by Mr. Muir (the engineer of the New River Water Company) in his evidence to be, probably, £150,000 per annum.

Nor would this be the only expense.

House fittings and pipes which had been designed to bear 40 feet of pressure, or even 100 feet of pressure, must be at once discarded, when the mains were charged with a pressure of 300 to 400 feet, and in corroboration of this, we would refer again to the evidence of Mr. Muir, and also to his estimate of £8 per house as the cost of the alteration—an estimate which, from the investigations we made when Lord Methuen's Water Fittings Commission was sitting, we believe to be substantially accurate, and certainly not to err on the side of over-statement. Besides this, the annoyance to which householders would be put from a general revision of the leaden pipes and the alteration of the various fittings would be very great.

We have now (at too great length, we fear, but still as briefly as we were able) laid before you the principal difficulties which must be overcome, the outlay that must be made, and the annoyance that must be borne, before the inhabitants of the Metropolis could, upon any system heretofore devised, enjoy the advantages of having water from unsuspected sources, for the purpose of drinking; and at adequate pressure and in sufficient quantity for the purpose of extinguishing fire—difficulties, outlays, and annoyances which would exist even if the water-works were in the hands of the Metropolitan Board; but we have felt bound to make this statement, in order to enable the nature of the plan which we are now about to submit to you to be properly contrasted with the modes which have been previously suggested.

So long ago as 1862, the late Mr. James Easton brought before Mr. Thomson Hankey's committee a proposal for instituting an entirely separate system of mains to be used for fire purposes only. These mains were to be supplied from reservoirs of efficient elevation, and were to be of adequate size to afford proper hydrant jets all over the Metropolis.

This plan has, during the present inquiry before Sir H. Selwin-Ibbetson's committee, been commended not only by ourselves, but also (except on the ground of expense) by Mr. Muir, and indeed, except upon this question of the great expense to be incurred for the solution of the fire question and the fire question alone, the plan has received general commendation. We now beg leave to submit to you our proposal for a modification in the way of extension of this system, a modification which will, we believe, solve not only the fire-extinguishing difficulty, but also that other and far more important question and difficulty—that of the potable water.

Although the average daily supply per head for all purposes is over 30 gallons, we, after careful consideration, estimate that not more than 2 gallons per head are really used for drinking and for cooking—say 8 million gallons daily for the whole Metropolis. The quantity required for the purpose of extinguishing fires, as appears from evidence before Sir H. Selwin-Ibbetson's committee, is not, although large for the time that the fire is raging, on the average for the year more than 1-400th of the total supply, or at the rate of 300,000 gallons per day, making for potable, for culinary, and for fire purposes, 8½ million gallons per day; but to allow for increase of population, and to provide for other contingencies, we have based our calculations upon 16 million gallons per day.

Now, although there are insuperable difficulties in substituting for the water at present pumped from the Thames and Lea, water from other and acceptable sources, there would be no difficulty whatever in obtaining from the country surrounding London the 16 million gallons, or double that quantity if necessary, of the purest, brightest, and most palatable and wholesome water that can possibly be desired.

We propose to supply by separate mains, constantly charged, this pure spring water, under high pressure, for potable purposes, to every house, and to use the same mains, water, and pressure for the service of the hydrant jets to extinguish fire.

To carry this out we should provide, on the high ground to the north and to the south of London, four covered service reservoirs, holding an aggregate quantity of 32 million gallons, or enough for four days consumption.

These reservoirs would be at 400 feet above Ordnance, and from each reservoir would proceed sets of arterial mains, which would traverse the Metropolis (crossing the river), and would be coupled up so as to put all the reservoirs into communication.

From these arterial mains, supply-mains would proceed along the streets.

It is agreed on all hands that the best position for hydrants is at the footway rather than in the roadway. This being so, we propose to lay the supply-mains under the footway at each side of the road. This would have the additional advantage of making the cheapest possible connexion with the hydrants, and at the same time interfering to the least extent with existing pipes, and with the paving and road traffic.

And this position of the supply-mains would also involve the least cost and difficulty in the connexion of the house services for potable water.

In each house we propose to fix an air-tight pressure receiver, holding, according to the size of the house, from two to ten gallons. This receiver would be placed in the basement, and close to the point of inlet of the service-pipe. It would have only one draw-off tap, from which the water would be taken, and when the receiver was emptied it would be so arranged as to fill up again gradually.

To revert to the covered service reservoirs.

For the purpose of supplying these, we propose to sink, in the great water-bearing strata in the country districts around London, wells and borings, at distances varying from about 15 to 20 miles from the centre of the Metropolis, and by proper pumping-stations to lift the water from them into the four reservoirs. We have estimated for two sources of supply, and for two pumping-stations for each reservoir, making a total of eight pumping-stations from which to derive the 16 millions of gallons per day.

We have spent much time and consideration in determining the length and dimensions of the pipes and the number of hydrants that would be required, the cost of the pumping-stations and reservoirs, and of the sites, and we estimate the expense as follows:—

Reservoirs, pumping-stations, and sites for the same	£512,000
Mains from pumping-stations to reservoirs	533,000
Arterial and distributing mains, including crossing the river, and paving	3,195,000
Hydrants fixed upon the supply-mains when being laid	600,000
House fittings	600,000
	£5,440,000
Say	£5,500,000
The interest on £5,500,000 at 3½ per cent. amounts to	£192,500
The annual cost of pumping, including depreciation, and a sum for management, we estimate at	32,500
Total annual charge	£225,000

Against this sum of £225,000, however, should be put the following set-offs:—

1. The saving of the contemplated extension of the Fire Brigade, involving an outlay of per annum	£50,000
2. A saving in the present expenditure of the fire brigade by the reduction in the number of engines, and by the wear and tear of engines, of at least	10,000
3. There will be no longer any need for the water companies to increase their pressure beyond their existing statutory limits, nor to make the alteration in the fittings consequent upon continuous service, and upon the increased pressure necessary for hydrant jets. Taking Mr. Muir's estimate of £8 per house as an average for the cost of fittings, there is a saving in this respect upon 450,000 houses (the assumed number in the metropolitan area) of £3,600,000, which at 3½ per cent. equals	126,000
Further, we have already stated Mr. Muir estimates the annual charge of pumping the water from the present various levels to which it is raised to the increased height necessary for hydrant jets, at per annum. This would be saved.	150,000
Lastly.—The cost of hydrants would have to be incurred if their jets were fed by the water companies, and these hydrants, not being laid down at the same time as a new system of mains would be laid down, could not be estimated at less than £750,000, which at 3½ per cent. equals	26,250
Making a total of, per annum	£362,250

So that by the adoption of the proposed plan, there would be an absolute saving of £137,000 per annum, as compared with the annual charge for the outlay that must be made to render the present water supply adequate simply for the extinction of fires by hydrant jets; and further, such outlay would in no way solve the more important question of the potable water. It would leave that subject exactly where it is now, whereas the plan we offer to you, which is £137,000 less costly, provides for both of these essentials to health and safety.

To sum up, the advantages of the plan now proposed are these:

1. It affords the most wholesome and agreeable potable water.
2. By providing throughout the Metropolis a full supply of water, at an adequate pressure, for effectually extinguishing fires by hydrant jets, it renders serious fires almost impossible, and thus effects an enormous annual saving of property.
3. It accomplishes both objects, without interfering with the existing water companies.
4. It reduces to a minimum the alteration of the existing house fittings, one simple and inexpensive fitting to each house being all that is required.
5. It is the only plan by which the essentials of a proper supply of pure drinking water, and a supply for fires at high pressure, can be provided at a moderate expenditure, even if the Metropolitan Board should become the proprietors of the water companies undertakings.

In conclusion, we beg leave to say that we have been deeply impressed with the importance of the question that the Board have been pleased to refer to us. We have given it long and careful consideration, and we believe that the plan we have proposed, remedying as it does the two grave defects in the companies existing arrangements, will recommend itself to your judgment, as it has done to ours, the more thoroughly it is considered.

(Signed) J. W. Bazalgette.
F. J. Bramwell.
Edward Easton.

On the motion of Mr. Roche, seconded by Mr. Freeman, the recommendation of the committee was agreed to, and it was stated that the whole subject, in conjunction with the report of the Fire Brigade Committee of the House of Commons, was still before the Works Committee, and at an early date after the recess they would go fully into it.

Reductions in the Price of Gas.—At the meeting of the Batley Town Council yesterday week, it was resolved to reduce the price of gas from 4s. 6d. to 4s. per 1000 cubic feet, the discounts to remain the same as at present. At Grantham, the price, from the 1st ult., has been reduced from 4s. 7d. to 4s. 2d. per 1000 cubic feet. At Huntingdon, from the 1st of September next, the price will be reduced 5d. per 1000 feet—viz., to 5s. 5d. It is reported that the directors of the Louth Gas Company have resolved to reduce the price of gas 5d. per 1000 feet, so that the cash price will be for the present and ensuing quarters 3s. 9d. per 1000 feet. The Birkenhead Gas and Water Committee have recommended a reduction of 3d. per 1000 feet in the price of gas, to take effect on the 1st of October.

Cleveland Water Company.—The half-yearly meeting was held at the company's office, Saltburn-by-the-Sea, on Thursday last—Mr. J. S. Wharton in the chair—when the following report of the directors was presented and adopted:—"The accounts show a disposable balance of £2647 5s. 1d., after payment of interest on loans and calls paid in advance amounting to £399 5s. 4d.; and the directors recommend that a dividend at the rate of 10 per cent. per annum on the original and A shares, and 7 per cent. per annum on the B shares (free of income-tax) be declared payable on and after the 10th prox. This will absorb £2279 17s. 3d., and leave a balance of £367 7s. 10d. to be carried to the credit of next half year's account." From the accounts it appears that £70,152 10s. 6d. has been expended on capital since the formation of the company; the half year's receipts on revenue account, including balance brought forward, have been £3722 3s. 10d.; working expenses and repairs during the same period have absorbed £675 13s. 5d., leaving a balance of £3046 10s. 5d.; preference interests, require £399 5s. 4d., leaving a net disposal dividend balance, as stated in the report, of £2647 5s. 1d.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

The Half-Yearly Meeting of Shareholders was held on Monday, the 30th ult.—the Rev. Dr. PHELPS in the chair—when the following report of the directors was presented:—

The directors recommend that a dividend for the half year, after the rate of 10 per cent. per annum on the consolidated stock, and after the rate of 7 per cent. per annum on the amount paid up on the new shares, as well as one per cent. on the consolidated stock and shares on account of the deficiency in the dividend paid for the half year ending Midsummer, 1873, be paid on the 1st of August, free of income-tax.

Plans and specifications have been prepared for carrying out the necessary renewals and additions referred to in the report issued to the shareholders at Christmas last, and the works will shortly be commenced.

The directors have to again express their sincere regret that a vacancy has occurred in their number by the death of their much lamented colleague, Mr. Joseph Wentworth, who for many years was a valued member of the board. They have elected in his place Mr. William Clayton. By this election the office of auditor of the company's accounts has become vacant, and it will be the duty of the shareholders to elect an auditor in the place of Mr. Clayton.

The retiring director is Mr. Dennis Adams; the retiring auditor Mr. G. W. Fitch.

Mr. James Weeks, the manager, in his report for the half year ending at Midsummer, said the works had been efficiently maintained. With the exception of an enlargement of main for the supply of Cavendish College, no extensions of any importance had been made during the half year. The illuminating power, pressure, and purity of the gas had been kept fully up to the required standard.

The CHAIRMAN briefly moved the adoption of the report, and alluded to the loss they had sustained, not only at the board, but in the town generally, by the death of Mr. Wentworth. This was the second meeting in succession at which he had had to ask the shareholders to concur in expressions of regret at losses they had sustained. He might add that, in the place of the two gentlemen they had lost, they had been able to secure the services of two very able and effective directors, Messrs. Death and Clayton.

Alderman DEATH seconded the motion, which was agreed to.

The CHAIRMAN: Gentlemen, in proposing, as usual, the dividends which have been recommended by the directors, I desire to address to you a few remarks on the aspect of gas interests at the present time. On a former occasion, in defence of gas property, I advanced arguments to prove the reasonableness of 10 per cent. profits. Those arguments, I venture to say, have never been, and still less can now be, refuted. Public comfort and convenience require that the supply of gas shall be a local monopoly. This makes it reasonable that the business of those in whose favour such monopoly is practically guaranteed shall be subject to regulations which the Legislature does not impose on the various manufactures and other commercial undertakings liable to open competition. These latter are very properly allowed to make all the profit they can; and accordingly the dividends of skilfully managed banks sometimes reach 30 per cent., and those of insurance companies 60 or even 70 per cent. Among other reasons which I assigned, for not regarding 10 per cent. as an excessive profit on the capital invested in the manufacture and supply of gas, was the possibility that gas may be superseded by some other mode of lighting. It seems to me quite undeniable that the more prominent and plausible this source of danger becomes, the more valid is the argument for a high maximum rate of profit. Now there never was a time when scientific research was so active and successful as at present, and gas companies may be sure that, as in the past, so now more than ever, scheme after scheme will be ventilated, company after company will be enrolled, project after project will be thrown on the market, in the certain assurance, as it will be affirmed, that the days of gas are numbered, and that gas lighting is at length to be superseded. I urged this possibility, I say, among other reasons for not regarding 10 per cent. as an excessive profit. But I omitted to urge one point which greatly strengthens this argument. It is this—that modern science has made such wonderful progress, and exhibited such marvellous power, that nothing seems beyond its reach. Each successive project for superseding gas claiming scientific research for its origin and development, however extravagant its promises, is sure to find honest and enthusiastic support in the press. And the injury to gas property—even by a project so supported, which is destined to failure—is that, instead of such property continuing to be regarded simply as a safe investment, subject only to fluctuations with those of the value of money itself, and free from all stock-jobbing operations, as it has hitherto been, it may easily be converted into one of the most speculative of all investments—a property of no stability or convertibleness at all, written up and written down, just to serve the purposes of the Stock Exchange gambler. What I mean to say is this, that even when men of intelligence and science are convinced that such and such projects for superseding gas will fail, the injury to gas property may, nevertheless, be a real injury and practical depreciation, by increasing its liability to sudden and unreasonable fluctuations of price. And this special and apparently unavoidable inconvenience, appertaining thus more and more to gas property, I maintain to be a further justification of a profit of 10 per cent. on the capital of gas companies. With regard to the new danger with which our manufacture is just now threatened, the Electric Candle, which is said in some of the London journals to have produced a semi-panic in gas shares on the Stock Exchange, I can only say that at present there is not the least reason to believe that it will ever compete with gas, even in the public lighting of streets, and still less that it will come to be used in the lighting of buildings of any kind. Your directors cannot give you a stronger proof of their confidence in the permanence of gas lighting than by the fact that, in accordance with the recommendation of your engineer, Mr. Hawksley, they are about to make a very considerable enlargement of the works, requiring the outlay of much of the still uncalled capital which your Act of Parliament has authorized. But, indeed, if we consider the constantly increasing number of uses to which gas and the residual products of its manufacture are being applied, the chance of gas lighting being superseded will, in my opinion, appear to be very small indeed. Of these uses I will just allude to one—viz., that of cooking food. Until quite lately I had no experience of the advantage of gas in the preparation of food. I have now examined carefully and practically a variety of apparatus. Let us suppose that in a small household a kettle of hot water is required at any hour in the morning—say seven o'clock—for a cup of tea or any other purpose. Also that the family sit down to breakfast at nine. Let their breakfast consist of broiled fish, kidneys, or sausages, in addition to tea or coffee and bread. Instead of the cook having to be down by six o'clock to get up a good fire for the early kettle, and then to keep it up and ready with a clear bright surface and a sharp heat for broiling, she puts a match to a small iron ring of jets of a mixture of gas and atmospheric air, after the manner of the Bunsen burner, ten minutes before seven. At seven the water boils, and she turns out the gas. At 8.40 she puts the match to a double row of jets of the same mixture from an iron pipe about 12 inches long, and beneath these she inserts a tiny tray with wire bars supporting the fish, chop, or other food to be broiled. By nine o'clock breakfast is ready, and the gas extinguished. The quality of the performance—I can vouch for it—is simply perfection. I confess I am somewhat fastidious, but I declare that, except, perhaps, from the great City gridirons, I never had such broils as are produced from this simple, tiny, inexpensive gas cooking apparatus. Another, with a slight addition, will roast or boil a couple of chickens, prepare soup, vegetables, &c., with the very minimum of attention. I found, by meter, that the cost of the gas consumed in broiling a sole of medium size and eight sausages, on two separate trays, and with separate simultaneous lights, at 4s. per 1000 cubic feet, was less than a halfpenny. To be exact, it was 1-25th of a shilling. And what adds incalculably to the value of this application of gas is the facility with which the degree of heat is adjusted exactly to the requirement of the moment—moderated or augmented with a touch of the finger—so that the most violent ebullition or the most delicate simmer can be maintained almost as if by simple volition; nay, on a tiny apparatus, with two rings of jets, both processes can be maintained at the same time, and a roast as well, and all without subjecting the cook even to so much personal discomfort as is experienced in front of the best form of kitchener. Moreover, in the summer, the gas apparatus, which takes up almost no room, and may be placed in a back kitchen or scullery, enables the servants to have a cool, comfortable kitchen, altogether free from the heat and dust of a fire. Then, as to our residual products, I will just mention one—the coke. If the fire-grate in a sitting-room be constructed after a certain very simple and inexpensive model, coke makes one of the most agreeable fires possible. In my own study I burn nothing else. Besides being a truly excellent fuel, it is almost always a very cheap one—for this reason, that the gas company must get rid of it. If stored beyond a certain quantity, it not only occupies too much space, but it crumbles by its own weight, and costs much in labour to trim and stack. I am not going to detain you with mention of the numerous important secondary products manufactured from the tar. But I may just remind you of the fact that gas-works are now the principal source of the supply of that extremely useful substance, ammonia. Let me add to the foregoing that the activity of science is not being directed to the subject of lighting, only with the view of superseding gas; its power is constantly being brought to bear on the improvement and perfecting of the manufacture and use of gas itself. The truly valuable journals devoted to this subject in this country, in France, in Germany, and in America, demonstrate an amount of scientific skill and intelligence to be thus employed which cannot fail to be—as they have already been—continually productive of the most important and satisfactory results. The reports of the various meetings of gas managers are most honourable to the members of those important associations, and are full of scientific interest. I can assure our own shareholders, and the public of our own community here at Cambridge, that there is a real and conscientious anxiety on the part of the directors of this company—and I firmly believe I may say the same of gas companies all over the country—to render the gas as good and pure, and the manufacture as free from offensiveness as possible. With this latter object in view, we here have now, for some years, abandoned at our works the manufacture of the various products of the tar, and more recently we have ceased to manufacture sulphate of ammonia—both sources of considerable profit. I venture to hope, and I fully believe that these concessions have been accepted as proofs of our desire to act in conformity with the interests and wishes of our fellow-townsmen, and—thanks to our excellent manager, Mr. Weeks, and our staff of fitters and workmen—I am proud to add that no complaints of any kind have been made for a considerable period.

Mr. ELLIOTT SMITH seconded the motion, which was carried unanimously.

Alderman PEED proposed the re-election of Mr. Dennis Adams as a director, remarking that Mr. Adams took great interest in the affairs of the company. He thought the shareholders were much indebted to the directors generally, and particularly to the chairman, who had laid before them such an able and scientific statement with reference to the usefulness of gas. No doubt what Dr. Phelps had said would be duly appreciated. There was one thing to which the chairman had alluded which pleased him much, because it was a hobby of his—namely, that 10 per cent. was not more than they ought to get in an undertaking of that character. Indeed, he considered it was not enough, especially if they were to be attacked by this proposed new light. A gentleman who met him coming to the meeting said gas shares would not be worth anything in a few years time. He (Alderman Peed) replied that he hoped that would not be in the time of either of them. That was an additional reason why they should get as much as they possibly could while they could. All the directors were very much interested in the concern, and devoted a great deal of time to it. The question might hereafter arise whether, with increased duties, they should not have increased remuneration.

Mr. FITCH seconded the motion, which was agreed to, the CHAIRMAN remarking that Mr. Adams's services had been very beneficial to the company.

The retiring auditor (Mr. G. W. Fitch) was re-elected, and Mr. Edmund Foster elected an auditor in the room of Mr. Clayton, now a director.

Mr. ELLIOTT SMITH proposed that the thanks of the meeting be given to the chairman for his able conduct in the chair, and was sure that they all as shareholders had much pleasure in hearing the remarks he had made. As to gas cooking, he could bear out the chairman. Twelve months ago he had an apparatus from the company's office, and he had found it one of the nicest improvements he had introduced into his house, especially during the summer.

The motion was adopted, and in the course of a conversation as to the defalcations of the late collecting clerk, Coppin, it was stated that the matter was not entirely ready for report, but that there was every probability of the defalcations being wholly or almost wholly covered by the surety.

The CHAIRMAN, in acknowledging the vote, said he was very grateful for the good opinion of the shareholders. He had always taken great interest in the concern since he had been connected with it, and he should continue to do so. With regard to the disagreeable and painful business of the late collector, it had been a source of great trouble to them all. They would see by what was stated by Mr. Cockerell in the Assize Court that the directors did not desire to show any animosity, or to press the matter at all; but it was due to the company, to the public, and to the sureties that the defaulter should be brought to justice.

The proceedings then terminated.

YORK UNITED GASLIGHT COMPANY.

The Sixtieth Half-Yearly Meeting was held on Thursday, the 2nd inst.—Alderman WEATHERLEY in the chair.

The SECRETARY (Mr. C. Sellers) read the report, which was as follows:—

Your directors have to report that in the gas department the increase in consumption has been unusually large, and the financial result in consequence has been more favourable than they anticipated. This increase has arisen partly from the exceptionally dark weather during last winter, and partly from the increased use of gas, and its extension into nearly all the new dwelling-houses that have recently been so prominently added to the suburbs of the city.

This improvement, however, in the finances of the company is especially gratifying to your directors, because it enables them to look forward to the future with more confidence than they did six months ago, and because, coupled with a saving in the cost of coals, the improved finances assisted them, immediately after the close of the past half year, to reduce the price of gas from 3s. to 2s. 6d. per 1000 cubic feet. Your directors feel sure that this policy of appropriating all surplus profits to the reduction in the price of gas will be fully appreciated by the gas-consuming public.

In the other departments of the company's business a full share of work has been done, and the company's plant maintained in good order.

The vacancy at the board through the death of the late Alderman Steward, and alluded to by your directors in their last report, has been supplied, pursuant to the company's Act, by appointing Mr. Henry Preston, an appointment which the directors believe will be approved by the shareholders.

Your directors recommend that the usual dividend of 5s. per share be declared, the same to be paid on and after the 7th inst., free from income-tax.

Apart from the details connected with the report for the past half year, your directors have to call the shareholders attention to the fact that the total capital authorized by the company's Act has now, with the exception of a balance of £461 3s. 11d., been called up and expended. In view, therefore, of the growing character of the company's business, your directors propose to ask the consent of the shareholders to their taking steps to obtain the necessary authority for increasing the capital of the company, with such additional powers as may be deemed necessary for successfully carrying on the business of the company.

The balance-sheet showed receipts from the sale of gas, coke, &c., £18,811 0s. 7d.; sale of fittings, £1374 10s. 9d. The payments had been—Fittings and fitters wages, £1180 11s. 9d.; coals and lime, £6435 1s. 11d.; retorts, ironwork, &c., £2372 8s. 7d.; direction, £300; salaries and stokers wages, £1899 4s. 2d.; rates and taxes, £299 6s. 9d.; printing, £103 2s. 8d.; law, £14 2s.; bad debts, £10 10s. The balance available for dividend and working capital was £17,581 0s. 7d.

The CHAIRMAN, in moving the adoption of the report, said that in meeting the shareholders it afforded him pleasure to congratulate them on the satisfactory condition of the affairs of the company. On previous occasions they had not unfrequently had reasons for looking with considerable anxiety to the future; that anxiety, however, had, for the present at least, passed away, and they met confidently anticipating a period of increased prosperity. The revival of trade in various branches to a complete activity in the city and the immediate neighbourhood, together with a rapidly increasing population, were reasons why they should look hopefully to the future. The directors had entered into a contract for the supply of good coal at a fair price, and in consequence of the iron market being favourable to purchasers, they had bought and had in stock more than the usual quantity of mains. The sale of coke, &c., had during the past half year been very satisfactory. These circumstances, coupled with the increased consumption of gas, had, they believed, justified them in announcing a reduction in the price of gas of 6d. per 1000 feet, so that they were now charging 2s. 6d. per 1000 to the general consumers, without causing any reduction in the dividends of the shareholders. They would fail in their duty to the public and to themselves unless they made provident arrangements to enable them to keep pace with the development of the city and its suburbs. They, therefore, thought the time had arrived when they should seek for powers to increase their capital, and be prepared to satisfy all the requirements that might arise. A resolution would be submitted to the meeting for approval, allowing the directors to apply to Parliament for the necessary powers.

Mr. TAYLOR seconded the adoption of the report, and the motion was carried unanimously.

The CHAIRMAN proposed, and Mr. TAYLOR seconded—"That a dividend at the rate of 5s. per share, without deduction for income-tax, be now declared for the half year ending the 30th of June last, and that the same be paid on and after the 7th inst."

This was agreed to, and resolutions having been passed re-electing the directors for the ensuing half year,

The CHAIRMAN proposed—"That this meeting concurring in the opinion of the directors that additional capital is required to meet the growing business of the company, hereby requests and authorizes the directors to take the necessary parliamentary steps for increasing the capital of the company, and for obtaining such additional powers as may be deemed expedient for successfully carrying on the business of the company."

Mr. TAYLOR seconded this resolution, and it was adopted without discussion.

Mr. HARGROVE moved a vote of thanks to the chairman and directors for their services during the past half year. In doing so, he referred to the report as a hopeful one. There was not only a reduction in cost, but the concern was in a great state of prosperity, and they had full confidence in the directors. He approved of the increase of capital.

Mr. FELTOE seconded the resolution, and said he thought the shareholders might congratulate themselves upon the good sense and wisdom displayed by the directors in the administration of the affairs of the company. He also expressed an opinion that they were quite right in endeavouring to make provision for the future.

The vote of thanks having been acknowledged by the chairman, the proceedings ended.

DUBLIN CORPORATION AND THE GAS COMPANY.

At a Special Meeting of the Dublin Municipal Corporation, on the 5th inst.—the Right Hon. the LORD MAYOR presiding,

The TOWN-CLERK read the following letter:—

17, *Great George Street, Westminster, S.W., July* 25, 1877.

To the Right Hon. the Lord Mayor of Dublin.

My Lord,—Messrs. Pritchard, Stevenson, Church, and myself met this morning, to see what measures ought to be taken to obtain a final settlement of our claims on the corporation, which have so long remained in abeyance, and I am requested to express our mutual views on the subject.

In the circular of the 10th of April, prepared after the meeting of the members of the corporation called by your lordship, the settlement of our claims is made to rest on their honour, This is, indeed, the only way in which the case can be looked at.

It is well known to your lordship that the Bill was lost because the corporation would not fulfil the agreement entered into with the gas company to give the security which they thought needful for the payment of the purchase-money, and that the course they took was contrary to the advice of their counsel and witnesses. By this, their action, the corporation not only lost a very valuable purchase, but sacrificed our interests also; for if the Bill had passed we should have had a legal claim for our justly earned fees, and the expenses incurred in the formation of the Bill.

But the loss of our legal status necessarily followed the loss of the Bill. The corporation, feeling very fairly that we ought not to be injured by their action, desired to meet our claims, but found they had not the legal power to do so, and we were advised that they wished us to bring an action against them, which would not be defended. We did as we were advised, but the action, though gained in the first instance, was defeated on technical grounds on appeal, and we, by following the advice given us, were involved in a further cost of more than £300 law expenses. We were then advised that the members of the corporation wished to settle our claims privately, but when pressed they failed to do so.

Now the final attempt at a settlement is made, which, we trust, will be made without further delay. We bring these facts before your lordship that you and your committee may see how great is the consideration we have shown to the members of the corporation. We believed that they desired to deal fairly, and we have given them every opportunity of doing so. We have been also aware of the important influence the case must have on other cases of the kind, for it is impossible for professional men to ascertain the position of local authorities and others, much less to provide for such a contingency as this. Therefore they must rely to a great extent on the honour and business integrity of those who employ them.

We feel sure that if your lordship will kindly give our request your consideration and influence a final settlement may be arrived at.—I have the honour to be, &c.,

C. G. CLEMINSHAW.

Mr. FRENCH said he would like very much to know who it was urged that proceedings should be taken. He had certainly heard nothing about it. He moved that those gentlemen be requested to state who urged or advised them to take proceedings.

Mr. M'DERMOTT: Certainly we ought to be apprised of that. I second the motion.

Mr. BYRNE: You can do nothing but refer the letter to committee.

Alderman GREGG observed that these gentlemen had valued the works in connexion with the gas Bill, which fell through. The result of the Bill not being successful was that they were left up to the present without the means of being recouped their expenses. The amount due to them had been reduced from £3000 or £4000 to £1200, which would only recoup them for actual outlay, loss, &c.—that was, in fact, the minimum sum requisite to recoup them. A meeting had been held in the Mansion House, at which the Lord Mayor presided, and gave practical assistance to the object for which it was convened—namely, that the corporation and the citizens should continue paying what was so lawfully due. The amount subscribed, however, only amounted to £150, of which £50 was given by the Chamber of Commerce. His lordship should try and induce every gentleman present, who valued the *prestige* of the corporation and of the citizens, to use his utmost exertions to have these gentlemen paid for their services. Even if it were necessary that an appeal should be made to the public, he felt that the claim should be paid. The matter was freely talked of in London.

The LORD MAYOR ruled that Mr. French's motion was not in order. He thought the matter should be referred to committee.

Mr. FRENCH said they merely could ask an explanation of the paragraph in the letter, to the effect that they had been urged to proceed against the corporation, and that the latter would not defend it.

Mr. BYRNE said there was never anything more inconsistent with honesty than the defence of the corporation to that action. The corporation employed these men to do a vast work at a time when the quality of gas in Dublin was disgraceful, and when its price was exorbitant. The former management of the gas company were not able to take 2500 feet of gas out of a ton of coal, the normal amount extracted in well-managed companies. They were not able to distribute the gas without loss for leakage of over 100 per cent. beyond the normal loss in well-managed concerns. The citizens, by this corporation, endeavoured to put an end to such a state of affairs; they formed a committee of this body, and in order to get the assent of the wealthier and more intelligent classes outside, whom he (Mr. Byrne) believed were not adequately represented here; they invited the Chamber of Commerce to send in 10 or 12 members to act with the council, and after all that, after these gentlemen had given their energy and ability, they were, by the so-called leaders of the Liberals, expelled. That was a disastrous course to pursue, for it put an end to public confidence in the project on foot. The gentlemen who were employed to judge of the value of the property ascertained all the defects of the former management, and the work which they accomplished in the performance of their duty was a vast one. They belonged to London, and gave their services as required, and were they not justified in assuming, when told that the corporation could not pay them without a judgment from some Court, that the corporation would not defend the action? He (Mr. Byrne) pronounced it to be the most disgraceful act ever perpetrated by any body claiming to be actuated by honest motives to enter into that defence. No gentleman present would in his private capacity act as the corporation had done, and treat these men in such a way. What prevented the corporation from paying them?

Mr. MURPHY: Want of money.

Mr. BYRNE denied that that was so. Others had had the results of these men's intelligence and labour. The directors and shareholders had had the benefit of the work done, and he thought the gas directors ought to bring this matter before their shareholders at their half-yearly meeting. The directors should tell the shareholders all they owed to the information supplied by these gentlemen to the corporation, and which had been placed at their disposal. The company had also taken over an officer, who had been in receipt of £600 a year, and who was well worth it, on the basis of the report of these gentlemen. He (Mr. Byrne) wished to know why the equitable objection to recoup these gentlemen should not be appreciated by the shareholders, who had availed themselves not only of the information supplied, but of the services of the valuable officer to whom he alluded. The members of the corporation should not, he felt, be called upon to put their hands in their pockets until the directors and shareholders repudiated their responsibility to pay those gentlemen. Any document not on the paper should be referred to committee. He thought, however, this was a matter that ought to be referred to the directors of the gas company, with a request that they should bring under the notice of the shareholders the vast services done them, and request their interference in the discharge of the liability to these gentlemen, and he would move a resolution to that effect.

Mr. GRAY, M.P., seconded the proposition, which was carried.

ADOPTION OF THE BURGHS (SCOTLAND) GAS SUPPLY ACT AT WISHAW.

On Friday, July 27, a special meeting of the Burgh Commissioners of Wishaw was held, for the purpose of considering the propriety of adopting the Burghs (Scotland) Gas Supply Act. As the ostensible author of that Act, Sir Windham Anstruther, Bart., M.P., is intimately connected with the division of Lanarkshire in which Wishaw is situated, and inasmuch as the agitation which contributed to the passing of the measure through Parliament was chiefly directed from that town, the meeting in question possessed a considerable amount of interest.

Provost GILCHRIST, who occupied the chair, briefly introduced the business, after which

Bailie ANDERSON moved—"That the Burghs (Scotland) Gas Supply Act, 1876, be adopted in, and applied to, this burgh." In supporting his resolution, he referred at length to the last occasion on which the question of purchasing the existing gas-works, or erecting new works, came before the commissioners. At that time they had applied to the gas company to supply the lower portions of the burgh with gas, and that request was refused. The want of gas at Craigneuk and Rumblingsyke was very much felt, as it was but common fairness to the inhabitants of those districts to have street-lamps, seeing that they paid rates similar to other portions of the burgh. Owing to the position taken up by the gas company, that could not well be rectified unless the Gas Act was adopted in the burgh. The agitation on the subject had, in his opinion, tended very much to lower the price of gas. At that time they were paying from 20 to 50 per cent. more than various adjacent towns, and though it was now greatly reduced, they were paying 10d. more per 1000 cubic feet than in Coatbridge, and even at that low rate he saw that 10 per cent. dividend had been declared, and £500 of profit ordered to be divided amongst the shareholders.

Mr. HUNTER seconded the motion.

Mr. THOMSON characterized the Act as a very complete one, and one well framed to carry out the purpose for which it was intended; but, before giving his adhesion to the motion, there were one or two things he would like to know. In regard to the price of gas being somewhat higher in Wishaw than in some of the neighbouring towns, he thought that remark would apply generally all over Scotland. Another question was—What advantage would accrue; and what advantage would their constituents derive by the adoption of the Act, and managing the works

themselves? Upon these matters he would like to be informed. He would not be satisfied with the bare statement that they would have the gas cheaper. He wanted to know how they would accomplish it? He did not profess to be thoroughly acquainted with the manufacturing and distributing of gas; but he knew this much, that the price of gas varied very much, according as the place was situated. To make his meaning more plain—the same capital expended in plant in a compactly-built town would give a much larger return than where houses were sparsely built, as in Wishaw, for instance, where the service-pipeage would be over three miles. There was another thing. If they took over the works, how were they to be managed? The commissioners work was growing right and left in every direction, and the question arose, could they devote the necessary time to it? He said, without fear of contradiction, that the board would not manage them more economically than the present company.

The PROVOST: Do they not pay a dividend of 10 per cent.?

Mr. THOMSON admitted for the last two years they did, but previously the dividend was 7½ per cent. He had no idea of moving an amendment, but he thought the community were fairly entitled to be informed on the question he had indicated.

Mr. BUCHANAN said although the Act was adopted it did not commit the burgh in the slightest degree. It only put them in a position to avail themselves of the privileges when required.

Bailie ANDERSON, in reply to Mr. THOMSON, said that information was obtained three years ago, and he did not think it necessary to bring the papers along with him; but, if Mr. Thomson wished, he could have the advantage of perusing them again. He was quite prepared to prove that had the works been in the hands of the commissioners for the last 15 or 16 years the burgh would have been the profiter. Nobody knew better than Mr. Thomson that the shareholders had large profits. At that time, he (Bailie Anderson) believed, there was a debt of £800 on the works. The works had paid all along, giving the shareholders 7½ to 10 per cent. When the last alterations were commenced upon them, there were £500 in the bank. Recently he had seen 10s. shares advertised at 14s.; surely that was benefiting the old shareholders, and could be of equal benefit to a larger number.

Mr. SMITH, in referring to the first stage in the movement, two or three years ago, said it was brought up in consequence of the gas company wanting a guarantee of 6 per cent. upon the outlay if they extended the pipes to Craigneuk. This they would not do, and a notice to take over the works was the result. He recollected distinctly a remark which fell from Mr. Thomson at that time, to the effect that he considered that was the very thing, but they had not the powers to do it. Some time afterwards influence was brought to bear upon the member for the county Sir Windham Anstruther, and he had succeeded in getting an Act passed. Now, he thought that in all fairness they were entitled to adopt it, and as soon as possible take the gas into Craigneuk, the very place for which the Act was passed. The question originated in Wishaw, and for the very purpose of supplying Craigneuk.

The adoption of the Act was unanimously agreed to.

HOKITIKA [WESTLAND, NEW ZEALAND] GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held at Hansen's Post-Office Hotel, Hokitika, on Wednesday, the 23rd of May last, when the following report by the directors was presented and adopted:—

Your directors have the pleasure of laying before you the balance-sheet and statement of accounts for the year ending April 30, 1877, which show the position of the company to have improved since last report, notwithstanding the exceptional difficulties encountered during the past year.

The number of meters fixed since last report have been 31, of which 14 are for cooking-stoves.

A test-holder has been imported from England, and erected at the works at considerable expense, thereby enabling a constant check to be maintained against loss either to consumers or the company by any default in meters. A coal-shed has also been erected, in order that such a supply of coals may be stored as will meet any emergency.

A slight reduction in the ordinary working expenses has been made. Your directors feel that, for the present, to attempt further reduction might only impair efficiency.

The great increase in the consumption of gas for stove and cooking purposes, thereby increasing very largely the expenditure for coals, without a proportionate return in gas-rates, has engaged the serious attention of your directors, and they would therefore call the special attention of the shareholders to the present rates the company receive for gas consumed thereby.

It will be seen from the statement of accounts that the company's plant has been added to, and also the sum of £145 19s. written off for depreciation and bad and doubtful debts, thus providing for the wear and tear which is necessarily going on from year to year, and showing only in our assets amounts unpaid which are to be depended on as recoverable and good.

An interim dividend of 7s. 6d. per share, absorbing £750, having been paid in November, your directors would now recommend that a further distribution of 5s. per share, amounting to £500, be made; and this the shareholders will be asked to sanction—making in all £1250 distributed as dividends for the year.

Dr. *Balance-Sheet, April 30, 1877.* *Cr.*

Cash in hand at last balance	£7	16	0	Bank overdraft at last balance	£157	4	2
Gas-rates and meter-rents	3500	3	1	Interim dividend (November)	750	0	0
Coke, tar, and lime	156	2	5	Coals	1098	1	2
Coals	37	8	3	Lime	177	12	5
Tanks (lime)	24	6	0	Meters	147	6	8
Sundries	19	15	0	Plant	153	17	3
Stoves and fittings	145	3	0	Sundries	133	5	0
				Premises	16	9	10
				Stoves and fittings	114	16	10
				Wages—			
				Manufacturing & purifying	429	10	0
				Lamps	51	3	10
				Salaries—			
				Manager	270	0	0
				Secretary	175	0	0
				Directors allowance	67	4	0
				Service-laying	26	6	9
				Interest	20	19	10
				Balance at credit, Bank of N.Z.	101	16	0
	£3890	13	9		£3890	13	9

Profit and Loss Account.

Amount of dividend capitalized	£2000	0	0	Balance, April 30, 1876	£803	12	9
Interim dividend	750	0	0	Capital account . £12,000 0 0			
Coals	1213	19	4	Less property, plant, and meters . . 11,275 7 6			
Wages	438	1	9		724	12	6
Salaries and allowances	512	4	0				
Expenditure	133	5	0	Gas-rates	3500	3	1
Sundries	72	3	8	Sundry products	158	2	5
Depreciation—meters	100	0	0	Gas-fittings, &c.	123	1	0
Bad and doubtful debts	45	19	0	Accounts due and unpaid	561	12	9
Balance	605	11	9				
	£5871	4	6		£5871	4	6

The Hon. James Bonar is the chairman, and Mr. Archibald Scott the secretary of the company. The capital is £12,000, in 2000 shares of £6 each.

FAVERSHAM GAS COMPANY.—At the annual meeting of this company on Wednesday last, a dividend of 10 per cent. was declared.

CAMBRIDGE UNIVERSITY AND TOWN WATER-WORKS COMPANY.

The Ordinary Half-Yearly Meeting of this Company was held last Friday—the Rev. Dr. OKES in the chair.

The directors, in their report, recommended that a dividend on the consolidated stock for the half year, and upon the first call on the new shares for the quarter ending July 6, 1877, at the rate of 10 per cent. per annum, be paid on the 1st of September next, free of income-tax. To assist in the payment of this dividend, the sum of £147 9s. 2d. would be appropriated from the suspense account. The directors expressed their sincere regret at the loss of Mr. Joseph Wentworth, one of the directors of the company from the formation in 1853, whose services had been, during the period of those many years, most valuable to the company. In his place the board had elected the Rev. C. K. Robinson, D.D., Master of St. Catharine's College.

The engineer and manager (Mr. Henry Tomlison) in his report to the directors, stated that, during the past half year, water from the company's works had been laid on to 81 premises, the increased rental derivable from which was £112 per annum. The total number of premises now supplied was 6819. The new works at Cherryhinton were approaching completion, and the additions to the distributing mains in the town were in full operation, producing very satisfactory results. The general condition of the company's works was satisfactory.

The CHAIRMAN, in moving the adoption of the reports, said it was hardly necessary to add to them. He considered he was rather fortunate in not being called upon, like the chairman of another company in the town, to give the shareholders a scientific address about their commodity. He did not think anybody could discover anything better than the natural gift of Providence which this company possessed at Cherryhinton. Nor need he say much more than was said in the directors report respecting the late Mr. Wentworth, or he might dilute the real and genuine expression of their feelings. From his remarkable business habits and knowledge of the town they found him exceedingly valuable in one branch of the concern; but he was glad to say that they had not been left without support in that respect. Neither was it necessary to say much about the reports. He thought the shareholders would never wish to see an alteration in the wording of the last paragraph of the engineer and manager's report—"The general condition of the company's works is satisfactory." It would be observed that the profit on the ordinary revenue account for the half year showed an increase, as compared with the corresponding half of last year, of £258 15s. 10d., being at the rate of £517 11s. 8d. per annum. The extra dividend required for the half year on new capital was £233 5s. 9d. Therefore, the increase in the profit had exceeded the increase in the amount required for the dividend, which must be very satisfactory.

Mr. ALLEN seconded the motion, which was adopted.

On the motion of the CHAIRMAN, seconded by Alderman DECK, a dividend was declared in accordance with the recommendation of the directors.

Mr. CLAYTON proposed, and Mr. PEELING seconded, a cordial vote of thanks to the chairman.

The CHAIRMAN, in acknowledging the vote, said he should always strive to discharge the duties devolving upon him, which were not hard; and he trusted they would never have to meet any more adversities than those they had hitherto prevailed against.

YORK NEW WATER-WORKS COMPANY.

The Half-Yearly Meeting of this Company was held on Thursday, the 2nd inst.—Mr. J. F. TAYLOR in the chair.

The report of the directors was as follows:—

The revenue of the company still continues to increase, and £5000, part of the mortgage debt of £8000, has been paid off.

The directors recommend that a dividend of 8s. per share on the ordinary shares, being at the rate of 8 per cent. per annum, and that a dividend of 2s. 6d. per share on the preference shares, being at the rate of 5 per cent. per annum, for the past half year, be declared, and that the same respectively be paid, without deduction for income-tax, on and after the 7th of August.

The works in connexion with the duplicate trunk main have been completed, and the directors have pleasure in reporting that the increase of pressure thus afforded has more than realized their expectations. The contracts for the new works at Acomb landing have been entered into.

The CHAIRMAN moved the adoption of the report. After congratulating the shareholders on its satisfactory character, he referred to the capital account, to one item in which he called attention—viz., £3762, which had been expended in pipe-laying, the greater part of which was incurred in putting down the duplicate main from the reservoir to near the Pack Horse Inn, Micklegate. That work was done at a very convenient time, and he considered that they had not been a source of nuisance to any one; besides, in consequence of the low price at which iron was sold, the directors were able to get the pipes at very favourable rates. In addition to constructing that auxiliary main, they had been extending their pipes to various parts of the city during the last six months, the chief extension being along the Haxby Road, the cost of which was included in the sum mentioned. The new main afforded a greater amount of pressure than the directors expected, and he did not know that there now existed in the city or suburbs a single cause of complaint as to the insufficient supply of water. Turning to the revenue account, he pointed out that the half-yearly water-rents were increasing steadily, and that there was a balance in hand of £6110 11s. 3d. in favour of this account. The half year was commenced with a balance of £3316, and the net profit was £3794. The sum of £3450 was required to pay the dividends, which would leave a surplus at the end of the present half year amounting to upwards of £300. That was very gratifying after paying the increased rate of dividend sanctioned at the last half-yearly meeting. The directors were engaged in a thorough repair of all the filter-beds. When the old company were established there were three beds, and from them the sand had been removed, but the lower strata had not been touched. The directors were now cleaning out the whole, and that entailed a considerable cost, which, however, would not be charged to capital account but to revenue. In conclusion, he stated that, in laying down the extensions of the mains, care was taken to provide for future requirements, as well as present wants.

Mr. FOSTER seconded the motion, which was agreed to.

The CHAIRMAN then moved a resolution sanctioning the payment of the dividends as mentioned in the report.

Mr. RYMER asked if 5 per cent. was the maximum dividend that could be paid on the preference stock.

The CHAIRMAN thought it might be increased to 6 per cent.

Mr. WOOD said that after the stock had been created as 5 per cent. stock, whether the dividend could be raised one per cent. was a matter which required consideration. One thing was quite certain, so far as preference stock was concerned, they could not go beyond 6 per cent.

Mr. FELTOE moved a vote of thanks to the directors. He said that they were entitled to a more substantial acknowledgment of their labours than they at present received, as with the enlarged capital and receipts their labours and anxieties had also increased. He, therefore, proposed that the fees paid to them be increased by £100 a year—from £300 to £400.

Mr. ANDERSON, in seconding the motion, paid a high tribute to the business qualifications of the directors.

Mr. FEATHERSTONE said the proposition must have taken the meeting by surprise, as no notice of it had been given. It was an unusually small meeting, and he thought it was undesirable to enter into an engagement of that kind, involving an expenditure of £100 a year, without having the cordial consent of the shareholders. He had no doubt that when it was brought before them their consent would be unanimously given. He felt as much as did Mr. Feltoe that the directors had discharged their duties in a faithful and admirable manner; but as the meeting was so small he moved the postponement of the resolution.

Mr. LAZENBY seconded this.

Mr. FELTOE withdrew that part of his resolution referring to the increase of the remuneration of the directors, but gave notice that he would bring it forward at the next half-yearly meeting.

The vote of thanks was passed, and the chairman having returned thanks the meeting terminated.

NORWICH WATER-WORKS COMPANY.

The Half-Yearly Meeting was held on Wednesday, the 1st inst.—Mr. H. S. PATTESON in the chair—when the following report was presented:—

The accounts of capital and revenue for the half year ending the 25th of March last now read by the secretary, have been audited in the usual manner and found correct.

After payment of working expenses, debenture interest, and preferential dividend, the revenue account shows a balance sufficient to pay a dividend at the rate of 6 per cent. per annum on the ordinary share capital of the company, leaving a balance of £270 14s. 10d. to the credit of the next half year's account; and the directors have therefore declared a dividend at that rate, which will be payable to the shareholders on the 3rd of August.

The company's works and property are in the most efficient order and condition, and the supply of water to the city still remains excellent.

The CHAIRMAN, in moving that the report be received and adopted, said that everything in connexion with the company was in a most satisfactory condition. The works were in a most efficient state, the water was excellent, and their customers kept on increasing. The directors themselves had made a thorough inspection of the works at Heigham and Lakenham, and nothing could be more satisfactory.

The motion having been seconded, was unanimously agreed to.

Mr. HAWKSLEY, C.E., at the request of the CHAIRMAN, addressed the meeting. He said the brief remarks of the chairman were so comprehensive and accurate that he himself had hardly anything left to say. With regard to the works, he could verify the statement which had been made that they were in an excellent condition. The shareholders had now realized their maximum dividend; and, after looking at the accounts, he was perfectly satisfied that they had earned that dividend quite fairly. Anything done in the future would be only adding good to good, from which they were not likely individually to derive much benefit; however, it was satisfactory to know that every addition to their property and their income became an additional assurance of their dividend, which would give a greater and greater value to the shares. In that sense their property might be considered as continually improving. From his knowledge of such undertakings, he might say that the number of years purchase, which share property of this description brought, was gradually increasing in all cases in which the circumstances were similar to those in existence in Norwich, where they had not only reached their maximum dividend, but where they would have in the future something to back that up, and assure it against all contingencies. Under those circumstances their property would become every year of greater value; and he was perfectly satisfied that in the future their shares would—in consequence of the dividend being so well assured—bring in a higher number of years purchase in the market than they had ever yet done. They knew by their own share list that the property of the company was not only valued at a very high rate in Norwich itself, but that it was esteemed very highly in different places, where people were anxious to get hold of the shares whenever they had an opportunity of doing so.

The CHAIRMAN pointed to the share list as showing the increased confidence of the public in the company. They had now 232 shareholders; and he believed that eight or ten years ago they had not half that number. Again, whenever there were any shares for sale, there was a great demand for them.

Mr. HAWKSLEY added that the very low rate at which the company could raise their money showed the confidence of the public.

The CHAIRMAN then moved that the best thanks of the shareholders be given to Mr. Ayris for his great energy, his attention to the works, and his vigilance in watching the interests of the company.

This having been seconded, Mr. AYRIS acknowledged the vote, and alluded in eulogistic terms to his able staff, to whose assistance he owed so much.

A vote of thanks having been accorded to the directors, the proceedings terminated.

HEBDEN BRIDGE GAS COMPANY.—A banquet to commemorate the twenty-fifth anniversary of the formation of the Hebden Bridge Gas Company was held at the "White Horse" Hotel, on Wednesday evening, Aug. 1. Covers were laid for 73, and the chair was occupied by Mr. Abraham Cockroft, vice-chairman of the board of directors. After the loyal toasts, the chairman called upon Mr. S. T. Rigge, of Halifax, to propose "The Hebden Bridge Gas Company." In doing this, Mr. Rigge said he did not know why he was called upon to propose the toast, unless it were because he happened to be one of the three surviving originators of the company. Mr. Rigge gave a lucid description of the commencement of the works, the opposition they met with, and their ultimate success. The company started with a capital of £5000, but as years went on this had, of course, to be increased. When the company started, the district was very inadequately supplied with gas by a private firm at 8s. 6d. per 1000 feet; now the gas company were charging 4s. 4½d. per 1000 feet. Mr. Jonathan Clegg, one of the directors, replied. Mr. John Greenwood, of Dewsbury, proposed "The Board of Directors," and the toast was acknowledged by the chairman. Then Mr. Abraham Robinson, in a eulogistic speech, presented to Mr. Henry Horsfall, chairman of the company, a very handsome timepiece, with two side ornaments, as an acknowledgment of his valuable services as chairman during the last twelve years. Mr. Horsfall acknowledged this kindness in appropriate words, and remarked that he had been a director of the company ever since it was registered. He gave a sketch of the proceedings of the directors since he became chairman of the board, thus supplementing the early history given by Mr. Rigge. He added that no concern in the kingdom was in better working order; and he did not think another gas company in the West Riding had paid 10 per cent. from the commencement. Should the demand for gas increase in the next seven years as it had done in the last, they would have to apply for another Act of Parliament, with very considerably extended borrowing powers. Mr. Patman gave the toast, "The town and trade of Hebden Bridge," which was acknowledged by Mr. Thomas Smith, draper. Other complimentary toasts followed, ending with that of "The ladies," proposed by Mr. S. T. Rigge, and responded to by Mr. W. H. Sutcliffe, solicitor. A very effective glee party was present.—*Halifax Courier.*

PROFESSOR B. SILLIMAN ON THE STOREAGE OF WATER.

The following correspondence has been forwarded to us for publication, by Professor Silliman:—

City Engineer's Office, Richmond, Va., June 6, 1877.

Professor Benjamin Silliman, New Haven, Conn.

Dear Sir,—I take the liberty of writing to ask if you can give me any positive information concerning the stagnation of water stored in large basins or reservoirs. Mr. M'Alpine has referred me to you as a high authority upon the subject, and I shall be glad to learn from you any facts in regard to it. It has been stated that drinking water stored at depths of ten or more feet, carries on a system of self-purification, and can remain almost an indefinite period in a quiescent state. Can you tell me about this, and also what proportion of flowing water is necessary to add to a given volume of stored water to prevent any deleterious effects? Your reply will greatly oblige.

(Signed) W. E. HUTSHAW, City Engineer.

Professor Silliman's reply is as follows:—

New Haven, June 11, 1877.

W. E. Hutshaw, Esq., City Engineer, Richmond, Va.

Dear Sir,—In reply to your letter of the 6th inst., I beg to say that for many years I have been an attentive observer of facts connected with the varying condition of potable water when stored in reservoirs and artificial lakes, whether by flow of rivers or from natural drainage, or both sources. The experience in all, or nearly all, such cases as have fallen under my observation is, that at the commencement of summer, about June 1, the water begins to develop a flavour and odour likened to a fishy smell and taste, becoming at the same time darker in colour and troubled in transparency. These qualities go on increasing in intensity for two or three weeks, becoming at times and in certain places so annoying as quite to disgust consumers, when gradually they disappear, and the water resumes its wonted quality. Occasionally the evil complained of is of longer duration, and if the summer is very hot and dry so as seriously to impair the water supply, the evils complained of seem to recur again in autumn with the fall rains, but disappear more or less in winter, when usually the water is at its best. Even in winter, however, if a sudden and somewhat protracted thaw of snow and ice occurs, the water, even in so large a work as the Croton of New York, assumes a degree of turbidity and the well-marked flavour of snow water.

I think there can be no question as to the cause of the disagreeable qualities complained of, and admitted by all fair-minded observers, under the first head named above—viz., that it is chemical change in organic matter, and that it is chiefly vegetable matter undergoing change, though not entirely so. It is especially in those works, in the construction of which, whether from thoughtlessness, or false notions of economy, the proper preparation of the surface of the earth to be covered by water has been neglected, and decomposing vegetable matter, the steep of stumps, and decaying plants, has been left to pour out its decay into the stagnant water, that the evil in question has been seen in its worst form. The infusion thus produced is a true pasture-ground for a numerous class of aquatic forms of life of both kingdoms—organisms which exist only in such waters—agents, no doubt, of purification, but, while doing their work, not agreeable either to taste, smell, or sight.

Now, it may be asked, how does it happen that this evil is manifest chiefly, or in a much greater degree, in May and June, than earlier or later in the season? The reply is, because, at this period of the year, the laws of equilibrium of temperature bring to surface the lower strata of water which during fall and winter rest quietly on the bottom, owing to the maximum density of water being at or about 39° Fahr. Whenever the surface water is colder than that temperature, it is also lighter, and floats on the surface. In proof of this it is only necessary in the autumn or winter to draw up a sample of the bottom water to observe that it is highly coloured with the organic steep, or vegetable infusion. Consequently, the water on and near the surface is no criterion of the character of the water near the bottom. The surface water may be quite colourless, while the lower stratum is as dark as weak coffee. If now the warm days of spring temper the water at surface, currents result which in a short time mingle the lower with the upper waters, and thus gradually colour, odour, and taste, none of them agreeable, are daily more and more apparent, until, after a time, by the operation of natural causes, the evils complained of are more or less completely removed.

In well-constructed reservoirs, where clean gravel and sand are made to replace the surface accumulations of organic and putrescible matter, the evils complained of are at a minimum, but are never completely absent; for the reason that, however well the bed of the reservoir may be prepared, the daily accumulations from surface drainage, and the incoming water of rivers, brooks, drains, pastures, barn-yards, &c., &c., must to a certain and sensible degree contaminate the stored waters. In times of heavy rains, freshets and spring thaws, this is more sensibly felt to be the case. Provision is sometimes, made for drawing off the lower stratum of water by gates provided for discharging sediments, &c., at a level below that at which the city supply is drawn. This is only a partial remedy, as a little attention to the laws of the flow of liquids will show.

The question which most interests water consumers in our cities is, "How are we to secure uniformly transparent, colourless, and good tasting soft water, suited to all domestic and manufacturing uses, and this at all seasons of the year?" We assume, of course, that the supply of soft water free from all sewage contamination is ample, and that the causes of annoyance are those which experience has shown to be well-nigh inseparable from the storeage of water in reservoirs, and of which the distinguishing characteristics are such as have already been cited above. The reply to this very pertinent question I conceive to be in two words, *subsidence* and *filtration*. The first removes sediments such as can settle in 24 hours, and the second removes colour, odour, and offensive taste, and the two together furnish at all times the healthful, agreeable, indispensable elements of comfort and enjoyment in our daily life.

Hitherto, in the United States, the use of subsiding reservoirs and filtering-beds, basins, and galleries remains almost unknown except to engineers. Only in Newark, New Jersey, if I am correctly informed, do we find an American city provided with water filtered, on a scale sufficient for metropolitan supply, by means of basins into which the water of the Passaic River finds its way through beds of sand, on the principle of filtering galleries, such as are common in certain cities of continental Europe, especially in France. In a Connecticut paper-mill, famed for the beauty of its paper, the water employed is all drawn through a filtering gallery constructed after the plans of Mr. B. S. Church, for many years resident engineer of the Croton. The results in these cases are entirely satisfactory. I mention them only to show that while the methods of preparing water by subsidence and filtration are not entirely unknown in this country, they are completely exceptional. Not so in Great Britain and continental Europe, where, especially since the scourge of the cholera in 1849, the practice of preparing water by these means for metropolitan use has become nearly universal. But it required the rough discipline of a severe visitation of Asiatic cholera to rouse the long-suffering population of London to an understanding of the unspeakable corruption and filth which destroyed the comfort and health of the most populous city of Europe. The parliamentary investigation which then exposed the nature

and extent of the danger, and revolutionized, by its rigid enactments, the entire system of metropolitan supply, are matters now well understood by all students of sanitary science and water supply, and need not be cited in this connexion further than to say that the total water supply of London has since many years daily passed through filtering arrangements after having first rested in subsiding reservoirs long enough to remove by gravity the coarser matters, which are never allowed to reach the filters. Thus over 100 millions of imperial gallons are daily filtered to the complete removal of all colour, smell, and taste, at a cost of about 2·40 dols. (say, 10s. sterling) for each million gallons of water thus purified. This estimate, by the engineer of the West Middlesex Water Company includes interest on the cost of the filters, and it amounts for each tenement, consuming 300 imperial gallons daily, to about 26 cents. annually. This subject has been carefully investigated for the city of St. Louis by Mr. J. P. Kirkwood, civil engineer, who visited Europe for the purpose, examining with care and in detail many cities in Italy, Germany, Holland, France, and Great Britain, where this system is in use on a large scale for the purification of water for domestic purposes. Mr. Kirkwood's results have been published in an elaborate report made to the Board of Water Commissioners of the city of St. Louis, and published by Van Nostrand, 23, Murray Street, New York, in a fine quarto volume, illustrated with 30 engraved plates. To this volume, and to the Parliamentary Blue-Books on water supply, I must refer you for details of a subject by far too extended and important to be considered in a letter.

It is surprising, and by no means creditable to the people of the United States, that with all that is now known and easily accessible to all who care to investigate this subject, that such an apathy should exist respecting it. Even St. Louis, after making this careful survey of the whole subject, contented herself with adopting a half-way measure, by constructing subsiding reservoirs, leaving the filtration of the still troubled waters of the Mississippi to a future day. Yet everywhere, almost, at this season comes up the cry, in this country, against the condition of the water supply. Water Commissioners content themselves with assuring consumers that the annoyances complained of are temporary or accidental—in fact, are much exaggerated by the lively imaginations of excited people who fear evils, from hydras and chimeras dire, which really have no existence. Occasionally chemists are called on to analyze and find nothing, or next to nothing, but a trifle of "organic matter," whether animal or vegetable it is hard to say. The microscope aids the chemist, and "nostoc" is declared to be the chief offender. It is the nature and condition of matter rather than its quantity which renders it agreeable or offensive to the human senses. Who can determine the quantity of the perfume which is wafted from an apple orchard by the wind, so delicious to the sense of smell? No analysis can detect the fatal poison lurking in the malarious atmosphere of the Pontine Marshes, or even estimate the grosser matter of the vile odour with which a single polecat contaminates the air over a large area for hours after its discharge. Let us not wonder, therefore, that the chemist fails to estimate the quantity or even the true nature of that offensive form of decomposing matter in which the nostoc thrives. All we know on this subject we really draw from the teachings of Nature in her process of filtration and aëration, by which all such contaminations are removed from water as it percolates the sand and gravel to the lower levels in which we find the brilliant water of wells and springs—water never surpassed in excellence until in overcrowded communities even these sources are poisoned by human exuviæ. The simple truth is that the matter in a state of change, which destroys the brilliancy of our water stored in reservoirs, and renders its taste and smell offensive or even disgusting, is of a nature to elude the chemist's art, and stands for the dust of the balance when he weighs it. This is a confession, perhaps not very complimentary to our science, but it is the truth, and has been humbly recognized as such by the ablest chemists who have made this subject a study—Letheby, Angus Smith, Frankland, and others. I do not now discuss the question, still in controversy, whether we can or cannot, with certainty, determine in water the presence of germs, or other forms of matter, which communicate typhoid and cholera, or whether these sources of danger to the public health can be removed by any other process than evaporation and reprecipitation in the form of rain and snow, upon pure and virgin mountain sides and hills, remote from the haunts of man and all his contaminations. It would require a volume to discuss all that has been written or is known on these subjects.

The questions of practical and immediate interest which you ask are perhaps sufficiently answered in what has been already written above. You ask (1) if it is true that water stored in reservoirs at depths of 10 feet or so carries on a system of self-purification, and can remain almost an indefinite period in a quiescent state? If this inquiry refers to the common case of storeage reservoirs, receiving a supply from rivers by natural flow or pumping, my experience requires me to answer it in the negative, and for reasons already before stated in sufficient detail. The common case of covered tanks so familiar in Alabama, Mississippi, and other southern States, filled with rain water, and lasting for years pure and unoffending, forms no exception to this conclusion, for obvious reasons. The ancients fully understood the value of this mode of storeage, and covered tanks on a vast scale—beautiful specimens of masonry—still exist in Italy, Sicily, Asia Minor, and other regions, dating back even to the Greek occupation of Italy, in proof of this statement. 2. You ask what amount of flowing water is necessary to add to a given volume of stored water to prevent any deleterious effects? This will depend chiefly on the quality or condition of the "flowing water." In almost any of our streams the quantity of foreign matter, partly sedimentary, and partly organic (vegetable chiefly), capable of undergoing transformation is quite sufficient to induce in stored water—which it becomes as soon as its condition of motion is exchanged for that of rest—the same state of things which is such an annoyance; and this brings us back again to the consideration of "What shall we do with it?" and to this question I know of no satisfactory answer but that already given—viz., *subside* and *filter*. To this end we must all come at last, and the sooner the necessity of such a decision is understood, and acted on by engineers and the public, the better for all who live in cities, and draw their supply from the public mains.

You will, of course, have seen the valuable paper lately published by General Gilmore on the waste of water by leakage in aqueducts and pipes, which, by his statement, amounts, in case of the Croton, and probably in other cases, to 70 per cent. of the total daily outflow of the sources. This vast leakage it is said can be very largely reduced by means of the detector described in General Gilmore's paper. The bearing of this statement, and state of facts, upon the question of filtration is very obvious. If all the water, amounting to about 100 million gallons daily (American standard gallons) now delivered by the Croton works was required to be filtered, the area of filter-beds requisite to do this work would, on the standard of British experience, be not less than 25 acres; while if the leakage can be reduced even to 50 per cent. of the flow, half this area of filter-beds will do the work.

A late French writer on the subject of potable water makes two classes of water—viz.: first, blue water; and, second, yellow water. To the first class belong all clear, colourless, well-filtered waters free from decomposing organic matter and vegetable extracts. Good well water belongs to this class, and pure mountain lakes fed from springs or from melting snows like the Lake Geneva, and the great North American lakes Superior, Michigan, &c. To the second class, yellow water, belong all our common rivers fed from the drainage of forests, swamps, and populous districts. Placed in tall cylinders of clear glass, the first class permits the passage of colourless light, so that white paper is seen of its normal colour when viewed from above through it; while the second class so far obscures and discolours the light, that even black letters on white paper are scarcely visible when viewed through a column of such water one foot in depth. The normal colour of water is blue, and its vapour gives us the blue of the heavens. Such water alone is truly transparent. In the famous Lake Tahoe, at an elevation of about 6000 feet on the Sierra Nevada mountains in California, the water—chiefly melted snow—is so transparent that the bottom is clearly visible at depths of 40 to 50 feet, and the boulders near the shore seem as if in free air when bathed under many feet depth of water. Even the Thames, so inky black at London Bridge, if taken near its source is so transparent in its blue waters, that its pebbly bottom is clearly visible at a depth of eight feet. Filtration has not completely restored the waters of the Thames drawn from near the City to their pristine transparency and brilliancy, but it has rendered them free of offence and quite tolerable, where before they were absolutely the reverse.

Pardon the length of this letter; the subject is a large and important one, and but half understood, even by professional men, and hence I feel it to be a duty to set forth these views whenever I am called on by a professional man in your position.

(Signed) B. Silliman.

ON THE TEMPERATURE OF COMBUSTION.

By M. Berthelot.

[Translated from the *Comptes Rendus*.]

1. The temperature of combustion of a gaseous mixture is, as all know, the excess of temperature which will be acquired by the gaseous products of combustion if they preserve the totality of the heat disengaged in the reaction. Q being that quantity of heat, and C the specific heat in weight of the products, we have $t = \frac{Q}{C}$, a formula which applies equally when the two gases burn in equivalent proportions, and when they are mixed with incombustible gases. In most cases, as M. H. Sainte-Claire Deville has shown, only a portion of the combustible gases enters into reaction; another portion remains in presence of a corresponding quantity of oxygen, because the temperature developed is high enough to determine the partial decomposition of the combination (dissociation). Let k be that combined fraction, and C_1 the mean specific heat (between zero and t) of the system, such as exists at the moment of the combustion, we shall have, in general,

$$t = k\,\frac{Q}{C_1} \qquad (1)$$

Q is a constant which depends solely on the initial temperature, which is here supposed to be zero; but t, k, and C_1 are three variables connected by equation (1).

2. We can find a second relation between these three variables by adopting the experiments of M. Bunsen (*Ann. Pogg.*, 1867). The idea of this illustrious physicist was to burn the combustible mixture at constant volume, and to measure the pressure, P, developed at the moment of combustion. Thus, calling g the theoretical condensation, that is, the proportion of the volume of the gases produced in a total reaction after cooling, to the volume of the primitive gases, we have the relation—

$$P = P_0\,(1 - k + k\,g)\,(1 + a\,t). \qquad (2)$$

Let a still be the mean specific heat at constant volume of the component gases, and b that of the composite gas, we have—

$$C_1 = (1 - k)\,a + k\,b \qquad (3)$$

$$t = \frac{k\,Q}{(1 - k)\,a + k\,b} \qquad (4)$$

$$\frac{P}{P_0} = (1 - k + k\,g)\left[1 + \frac{a\,k\,Q}{(1 - k)\,a + k\,b}\right] \qquad (5)$$

As we have for the three unknowns t, k, and C_1, connected by equation (1), substituted five connected by the three equations (3), (4), and (5), the problem remains indeterminate.

3. M. Bunsen endeavoured to resolve it by two hypotheses, namely, that the specific heat a of the component gases, and that of their products b, are constant quantities independent of the temperature and pressure. Thence k and t will be given by two equations of the second degree. The following table contains a summary of the results of M. Bunsen, whose permission to transcribe them has been obtained:—

	Combustible Mixture in Volumes.		$\frac{P}{P_0}$ Experiment.	k Calculated.	t Calculated.
I.	⅔ CO + ⅓ O		10·78	0·351	3172°
II.	Ditto		10·19	0·319	2893
III.	⅔ CO + ½ O + 0·1079 O		9·05	0·314	2558
IV.	Ditto	0·6857 CO	8·89	0·460	2471
V.	Ditto	0·8554 O	8·44	0·478	2325
VI.	Ditto	1·0861 O	7·86	0·490	2117
VII.	Ditto	1·2563 Az (air)	7·73	0·515	2084
VIII.	Ditto	ditto	7·35	0·470	1909
IX.	Ditto	1·7145 O	6·67	0·520	1726
X.	Ditto	2·1559 O	5·83	0·512	1460
XI.	Ditto	3·1629 CO	4·79	0·527	1146
XII.	⅔ H + ⅓ O		9·97	0·338	2854
XIII.	Ditto		9·75	0·336	2833
XIV.	⅔ H + ⅓ O + 1·2599 Az (air)		7·49	0·547	2024

According to these figures k, or the fraction actually combined, would increase from 0·31 to 0·53 in measure as the presence of a larger proportion of inert gas lowered more and more the temperature of the combustion; and the variation would have its maximum in the neighbourhood of 2500°. The discrepancy of one experiment with another amounts to 6 per cent. on the measured pressure, corresponding to a difference of one-tenth on the combined fraction and on the temperature; nevertheless M. Bunsen believed himself entitled to conclude that k remained invariable and equal to one-third between 3200° and 2500°, temperatures towards which half of the explosive gas rose suddenly to preserve anew a constant value until near 1150° and lower. There is no utility in discussing this question in a more profound manner, because the fundamental hypothesis of the constancy of the specific heat of the carbonic acid is erroneous.

4. It is only for the simple gases near the perfect state, and for carbonic oxide formed comparably of gases without condensation, that the experiments of Regnault and of Wiedemann authorize the admission of the constancy of the specific heat under constant pressure between zero and 200°. No other experiments have been made on the specific heats of gases under constant volume at different temperatures. Should we admit as a hypothesis which each may value as he chooses, that these conclusions are applicable to chlorohydric gas, the only compound formed without

condensation, and of which the formation can be determined by direct combustion, the specific heat of this gas being likewise reputed equal to that of its elements,* then, the equations of the first degree—

$$t = k\,\frac{Q}{C}, \text{ and } P = P_0\left(1 + a\,k\,\frac{Q}{C}\right)$$

permit the calculation of t and k, that is to say the dissociation, by the analogous experiments of M. Bunsen.

5. But none of these hypotheses, and consequently none of these calculations, are authorized by experiment for the gases formed with condensation, such as carbonic acid; in fact, the specific heat of such gases varies, and very rapidly, with the temperature. In connecting the specific heat under constant pressure with the molecular weight (which occupies 22·32*l.* at zero and 0·76 mètre), we find for the mean values of that quantity between zero and 200°—

For C_2O_4	$= 44$ grs. : $C =$	$8{\cdot}41 + 0{\cdot}0053\,t$	Mean of Regnault and Wiedemann.
„ Az_2O_2	$= 44$ „ : $C =$	$8{\cdot}96 + 0{\cdot}0028\,t$	Ditto.
„ C_2S_1 gas	$= 76$ „ : $C =$	$10{\cdot}62 + 0{\cdot}007\,t$	Regnault.
„ AzH_3	$= 17$ „ : $C =$	$8{\cdot}51 + 0{\cdot}00265\,t$	Wiedemann.
„ C_4H_4	$= 28$ „ : $C =$	$9{\cdot}42 + 0{\cdot}0115\,t$	Ditto.

The condensation is two-thirds for the first three gases; and two-fourths and two-sixths for the two others. It cannot be doubted that vapour of water would offer analogous variations.

The specific heats at constant volume have not been determined for different temperatures, but we know that their approximate value can be obtained for the gases which follow the laws of Mariotte and Gay-Lussac, by considering the difference of the two specific heats as equivalent to the exterior work of dilatation, that is to say, as represented by 1·93. We should thence have the mean value—

$$\text{For } C_2O_4,\ C' = 6{\cdot}48 + 0{\cdot}0053\,t.$$

But it is more than doubtful if that value is applicable under pressures approaching 10 atmospheres.

6. Let us calculate the combustion temperature of carbonic oxide with oxygen taken in equivalent volumes. According to this new data, and admitting $Q = 69{,}000$, we would have $t = \dfrac{69{,}000}{8{\cdot}41 + 0{\cdot}0053\,t} = 2900°$ about, at constant pressure; and $t = 3060°$ about, at constant volume; temperatures greatly lower than the 7200° and 8300° to which we are led by the hypothesis of constant specific heats. According to the above empirical formula, $C = 54{\cdot}3$ between zero and 3000°, which is a little more than double the value of the specific heat of the elements supposed to be gaseous. This, however, according to analogies, is not at all impossible; indeed, it exists for the chlorides of phosphorus and of gaseous arsenic. At constant volume, calculation gives $C = 22{\cdot}4$.

We must hasten to add that the empirical formula representing the specific heat of the carbonic gas only between zero and 200° could be extended to 3000° as merely a hypothesis to render evident the erroneousness of old valuations. We can also show in other ways that the values deduced are too great for application to the totality of the combustible gas; in fact, there results from it a pressure about one-fifth less than the figures found by M. Bunsen; but the admission of a partial dissociation is sufficient to render the pressures and temperatures compatible with the specific heat derived from the formula.

7. Nevertheless, the measures of M. Bunsen remain very valuable, accepting them as exact, because they enable a calculation to be made of the two limits between which the temperature of combustion is necessarily comprised, and that without any hypothesis as regards specific heat; nothing more is required for the calculation than an admission of the generality of the laws of Mariotte and Gay-Lussac. From equation (2) we draw, in fact—

$$t = \left(\frac{P}{P_0}\,\frac{1}{1 - k + k\,g} - 1\right) 273. \qquad (6)$$

It is clear that the combined fraction at the moment of explosion, is comprised between zero and 1 for a mixture formed in equivalent proportions; and between zero and m for a mixture containing $1 - m$ volumes of inert gas; whence in replacing k successively by zero and 1, or by zero and m, we shall obtain the two limits sought. These limits will be found in the following table:—

			$\frac{P}{P_0}$	t_1	t_2	
I.	$\frac{2}{3}$ CO + $\frac{1}{2}$ O		10·78	4140°	2612	
II.	Ditto		10·19	3900	2537	
III.	Ditto	+ 0·1079 O	9·05	3066	2198	
IV.	Ditto	0·6857 O	8·89	2760	2154	
V.	Ditto	0·8554 O	8·44	2537	2031	
VI.	Ditto	1·0861 O	7·86	2280	1875	
VII.	Ditto	1·2563 Az	7·73	2203	1838	
VIII.	Ditto	ditto	7·35	2083	1734	
IX.	Ditto	1·7145 O	6·67	1875	1548	
X.	Ditto	2·1559 O	5·83	1505	1319	
XI.	Ditto	3·1629 O	4·79	1150	1034	
XII.	$\frac{2}{3}$ H + $\frac{1}{2}$ O		9·97	3809	2449	
XIII.	Ditto		9·75	3718	2389	
XIV.	Ditto	1·2599 Az	7·49	2126	1715	

The combustion temperature of carbonic oxide with oxygen, at constant volume, is there comprised between 4000° and 2600°; and, with air, between 2200° and 1750°, limits already closely restricted. That of hydrogen with oxygen between 3800° and 2400°; and, with air, between 2100° and 1700°.

These last numbers appear rather small when compared with the melting point of platinum, estimated at 2000°, but in this estimation the specific heat of platinum is supposed constant, while, in fact, it varies with the temperature. If the laws of variation deduced from the measures of Dulong be adopted, platinum should melt at about 1400°; the true temperature is probably intermediate, but it is a disputed point; beyond the limits measured by the air thermometer, no temperature is known with certainty.

We would remark that, starting from the mixtures which contain their volume or more of inert gas, the difference between the temperatures calculated by Bunsen and the limit which corresponds to a total combination, does not exceed one-tenth.† The difference falls to 45°, and even to 4° for more diluted mixtures; such would be the interval between a total combination and a combination of one-half only; an interval too near the limits of experimental error to authorize any conclusion whatever, and *à fortiori* the admission of a simple law of discontinuous numerical relations.

But if these experiments give no other certain data relative to the degree, to the nature, or even to the existence of dissociation,* they appear, notwithstanding, to establish the possibility of producing temperatures really approaching 3000°.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The chief interest of the week, so far as the iron trade has been in question, has centred in the action of the smelters towards limiting the production of pig iron, and the probable results of their combination to that effect. So far the policy of restriction has hardly begun to be felt, inasmuch as the Scotch furnaces are only just blown out; but the preliminary effect of the movement has been to cause prices to go up to the extent of about 1s. per ton all round, in the brands of common and medium pigs. In some brands of hematite pigs, on the other hand, quotations have been lowered by 2s. 6d. per ton, and that notwithstanding the comparative activity of the Bessemer trade. It seems likely that the restrictive policy will be pushed to some lengths, but some firms evidently have every confidence in the future, seeing that at one already large concern, not many miles hence, two additional blast furnaces are in hand, and another is proposed to be built. These furnaces are, of course, of large size, and most modern design.

In finished iron of no kind is there any movement. Everything in this branch is lethargic, dull, and unprofitable. Many of the producers affirm that they only keep going in the hope of holding their connexion together for better times. Hoops, perhaps, sell better than any other kind of iron, except certain special goods made on contracts.

In the cast steel trade there is a very limited amount of business doing, chiefly for the home market. I hear of some tolerable orders from London and other gas companies being placed here for tool steels, as well as steel for retort rakes and other purposes. The coal trade is in an irregular and unsatisfactory condition, judging from the constant complaints of the coalowners, and the gradual spread of the movement for setting down collieries. Already several pits near Dronfield, in North-East Derbyshire, have been stopped, and two or three in South Yorkshire have now followed suit. In most cases the stoppage is for at least six months, but if trade be no better next spring, a number of coalowners will discontinue working their pits, and will remove the machinery, head-gear, &c.—steps which mean the abandonment of the workings for a time. Prices at present remain very quiet at the quotations mentioned by me last week.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade throughout this district continues in a very depressed condition, and although there have been no further announced reductions in list rates, beyond those noticed last week, prices generally show a great want of firmness. All classes of round coal are plentiful, and in some quarters there is a considerable accumulation of stocks. Gas coal still moves off only very slowly, and supplies in the market are considerably in excess of the demand. Quotations show no material change, but the contracts which are being given out are generally being placed at very low rates. For screened Wigan four-feet and ordinary descriptions of gas coal the average selling prices are about 7s. 6d. to 7s. 9d. per ton, and for good screened Arley 8s. 6d. to 9s. per ton at the pit. House-fire classes of coal are very difficult to sell, and in the second qualities there is a good deal of pushing for orders. Good Arley coal at the pit is offered at about 10s. per ton, and Pemberton four-feet can be got for 8s. per ton. Common coal is rather a drug, and the ordinary qualities are offering at 6s. to 6s. 6d. per ton at the pit. Burgy is now plentiful in the market, and is offering for less money than would have been taken a week or two back, the pit prices now ranging from 5s. to 5s. 6d. per ton. Slack also is not so firm in price, and can be bought at from 3s. to 4s. 6d. per ton at the pit.

In the shipping trade there has been a little more inquiry since the close of the Wigan strike, but the amount of business doing continues very limited, and prices low.

There is still very little demand for any description of iron in this district, but prices, as a rule, are about the same as last week. Local makers of pig iron are securing very few new orders, and for delivery into the Manchester district the top prices may now be given at 54s. per ton for No. 3 foundry, and 53s. for No. 4 forge, less 2½ per cent. Finished iron makers are also short of orders, very few of the works being fully employed, but the quotations for delivery into this district remain at £6 10s. per ton for Middlesbrough, £6 12s. 6d. for Lancashire, and £6 15s. for Staffordshire bars.

THE COAL AND GENERAL TRADE OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

There was again a comparatively steady business done in coals from the Tyne last week. The whole of the best collieries in the gas trade were fully employed, and medium and second-class pits fairly so. Prices were without change. Best qualities 8s. 6d., good medium 7s. 6d., second and inferior from 6s. to 6s. 6d. The shipments from the Tyne Dock were very considerable, and the demand was steady. There is a little better inquiry for gas coals for home use, and recently, on account of the low rate of freights, an order has been given to ship 10,000 tons to Montreal, and another 5000 tons to Boston, United States. This is very remarkable, as there was an impression that American coals had succeeded in driving ours out of the market. The demand for best steam coals is supported. Not only are cargoes being shipped to the Russian ports of the Baltic, but there is an inquiry for steam coals for Turkish Government account, to be shipped to Constantinople. The great drawback at present upon the north country collieries making a profit out of their large sales is the miserably low price paid for small coals, especially small steam coals. Many collieries which have a long haulage will realize little more than 6s. per ton after small steam are shipped in the Tyne and railway charges are taken off. The coke trade continues to do very well. A good deal is shipped to Spain and the Mediterranean ports.

The shipping business was a trifle improved last week. That was, an advance of something like 5s. per keel upon Mediterranean rates, and the same to the Baltic, with a further advance for steamers to load coals for Constantinople. The coasting business was unaltered, and most of the little ships as they begin to drop in will be taken up for the small byeports of the east coast and the British Channel until the harvesting comes on. The figure paid steamers to load coals to London is unaltered—namely, about 4s. 3d. for immediate shipments, and 4s. 6d. per ton for a series of voyages extending over the next six months. Rochester is 4s. 6d. per ton, and the rates to Hamburg are from £5 5s. to £5 10s. per keel.

The iron trade of Cleveland and the northern district improves a trifle.

* We know this last supposition to be not quite true, chlorine having a specific heat a little above that of the other simple gases under the same condition.

† M. Bunsen admits $Q = 67{,}300$ in place of 69,000, but this change in the heat of combustion of carbonic oxide does not sensibly modify the results of the calculation.

* Cyanogen burnt in air at constant volume forms an exception. In fact, it is easy to prove, admitting the pressure (11 atmospheres) observed by M. Bunsen, that the product is not composed exclusively of carbonic oxide, oxygen, and azote, but that it necessarily contains carbonic acid, the temperature of combustion being comprised between 2700° and 2100°.

Shipments are better as the autumn begins to approach. The chemical trade is likewise looking up a little, with an advance of price upon most kinds. The shipments of general manufacturing goods are more numerous, and a good deal of miscellaneous cargo is sent to London. Fire-bricks and that sort of material are in moderately good request.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

After many a flicker, the light supplied by the Aberuthven (Perthshire) Gas Company has been effectually extinguished, and the works, having been sold, are now in course of removal. Formed upwards of 20 years ago, the original company carried on business under many difficulties and discouragements, reaping on only one or two occasions a small dividend. The limited consumption necessitated the charging of a high price, and this, with bad times and the introduction of improved moderator lamps, has been too much for the company, and forced them to suspend manufacturing operations. Some time ago an earnest attempt was made to infuse new life into the concern, and the plant was disposed of to a new proprietor on advantageous terms. This has, however, failed to ensure success.

A public meeting was held in Milngavie last Tuesday evening, for the purpose of considering what steps ought to be taken in order to induce the gas company not to insist upon imposing a charge of 1s. 6d. per annum for meter-rent. The directors of the gas company, it appears, were formerly in the habit of charging meter-rent, but the practice has been discontinued for nearly 14 years. In consequence of the great increase of property in the burgh, they now find it necessary, it is said, to revive the charge, and have intimated accordingly to the consumers. After a number of persons had expressed their views on the subject at the meeting, a committee were appointed to wait upon the directors of the gas company, and report the result of their conference to a meeting to be held at a future date.

The question of charging a rent for meters, which was under the consideration of the Kilmarnock Town Council, when they sat as the Gas Commission last month, is still exciting a good deal of interest amongst the gas consumers of that town.

At the monthly meeting of the Aberdeen Town Council, held on the 6th inst., the Gas Committee reported that they had fixed the rate of interest payable on mortgages for gas purposes to be granted or renewed at Martinmas (Nov. 11) next, at 4 per cent. per annum; the other conditions to remain as at present. They also reported that 102 Aberdeen gas annuities had been purchased on account of the contingent-fund, the total cost, with expenses, being £645 2s. The minutes were approved.

The directors of the Crieff Gas Company have just appointed Mr. Napier, of Comrie, as the manager of their works. There were numerous applications for the appointment.

A limited liability company at Penicuik, near Edinburgh, are erecting new gas-works about half a mile to the north of the burgh, by which it is intended to supply not only Penicuik, but also Greenlaw, and a wide district, with gas. It is anticipated that the works will be completed and the gas supply turned on by the commencement of the ensuing winter. During the last few years there has been a great increase in the population of the district, chiefly through the opening out of new mining properties.

The Banff Town Council held a special meeting on Monday, the 6th inst., for the purpose of considering the propriety of adopting the Burghs (Scotland) Gas Supply Act, 1876, and applying it to the burgh. The Provost presided, and introduced the subject. After some conversation had taken place on the subject, it was agreed that the question should come up for decision at the next monthly meeting of the council, which should be made special for the purpose.

The following are a few data bearing upon gas companies in Fifeshire:—Last dividends paid—Leuchars, 3 per cent.; Newburgh, 3½ per cent.; Cupar, 5 per cent.; Newport, 6¼ per cent.; Kirkcaldy and Leslie, each 7½ per cent.; Dunfermline, 9 per cent.; Leven, 10 per cent.; St. Andrew's, 12½ per cent.; Dunfermline £17 10s. shares are quoted at £22; Kirkcaldy £10 shares (£10 paid) are quoted at £17 10s.; Leslie £1 shares (£1 paid) are quoted at £1 13s.; and the last quotation for the St. Andrew's £12 shares was £21.

Dr. Wallace's report upon the illuminating power of Glasgow gas for the week ending the 4th of August shows that in no case was the minimum under 25·71 standard candles, the average ranging from 26·85 candles to 28·60 candles, and the maximum from 27·98 candles to 28·94 candles.

The Police Board of Thurso have agreed to give the use of the water from their water-works for manufacturing purposes at the rate of 1s. per 1000 gallons.

It has been resolved to form the district of Jamestown, Vale of Leven, into a special water-supply district.

At the last monthly meeting of the Town Council of Port-Glasgow it was reported by the superintendent of the water-works that the amount of water in store was equal to a supply for all purposes for 60 days, as against 40 days at the same time last year.

Last week's Glasgow pig iron market opened quietly, and a good business was done at steadily hardening prices. On Friday the market was very firm, in prospect of the partial blowing-out of furnaces improving matters. The closing quotations were—sellers, 55s. 6d. cash, and buyers 55s. 5d. one month.

The coal market shows no signs of improvement; but, instead, orders are less plentiful, and coalowners are finding difficulty in getting away their outputs at prices a shade lower than the circular rates. Several cargoes of cannel coal have recently been shipped at Burntisland, and there was lately a shipment of 1300 tons of gas coal from the Clyde to Havannah by the large wooden ship *Chippewa*.

CLITHEROE GAS AND WATER SUPPLY.—The Town Council of Clitheroe, at their meeting on the 4th inst., adopted a resolution affirming the propriety of applying to Parliament in the next session for an Act to transfer the undertakings of the water and gas companies on the terms of the agreement with them.

DISS GAS COMPANY.—The report presented at the annual meeting of this company held last Tuesday showed that the receipts for the year, including the balance brought forward from last year, amounted to £2295 7s. 6d., with a profit of £472 4s. 9d. on the year's transactions. In accordance with a recommendation of the directors, it was resolved that a dividend of 10 per cent. should be declared.

ROMFORD PUBLIC LIGHTING.—The *Standard* says: "A paragraph appeared in our Friday's issue, stating that the Romford Local Board of Health, after vainly remonstrating with the gas company as to the quality and price of the gas supplied to the street-lamps, had resolved to invite tenders for lighting the lamps with petroleum. We are asked by Mr. Wilshaw, the secretary of the gas company, to state that no dispute has arisen between the local board and the company." A similar notice had appeared in *The Times*, the writer of which added: "Petroleum has been substituted for gas for lighting the street-lamps at Barking, and the change is said to work satisfactorily and economically." Probably there is as much truth in the latter as in the former statement.

ALLEGED FRAUD BY GAS OFFICIALS AT FORFAR.—On Thursday week, at the Police Court, Forfar—Bailie Reid on the bench—William Jack, meter inspector, and William Smith, clerk, both employed at the gas-works, were charged with two cases of falsehood, fraud, and wilful imposition, by fraudulently representing and pretending to Catherine Walker that, according to the index of her gas-meter, her gas account for the third quarter of the current year was 2s. 5d., for which they received payment, and gave a receipt; whereas, according to the real index, her account should have been 1s. 6d., which sum the accused paid over at the gas-works. In like manner they were charged with defrauding William Laird, factory worker. There were 34 similar charges lodged against them at the police office. They were remitted to the Fiscal.

STOCKTON AND MIDDLESBROUGH WATER-WORKS COMPANY.—The half-yearly meeting was held on Tuesday last—Mr. Henry Pease in the chair—when the following report of the directors, read by the secretary (Mr. T. A. Simpson) was unanimously adopted:—"The statement of accounts for the half year ending June 30, 1877, duly examined and certified by the auditors, together with their report, will be laid upon the table for inspection. After payment of all fixed charges, dividends have been declared on the original and A shares at the rate of 12s. 6d. per share, and on the B and D shares at the rate of 10s. per share, payable at the National Provincial Bank of England, Darlington, on Wednesday, August 8, 1877. The shareholders will be anxious to know what progress has been made in the arbitration that is to determine the amount they will receive for their property, about to be transferred under the provisions of the Stockton and Middlesbrough Corporations Water-Works Act, 1876. On this point the directors may state that the arbitrators and umpire, with the professional gentlemen engaged on both sides, have arranged that the first meeting is to be held on the 29th of October next, at the Surveyors Institute, Great George Street, Westminster. It is therefore not improbable that the business will be finally settled in the early part of January next."

WINDSOR DRAINAGE.—The drainage of Windsor, which has cost the borough over £40,000, the application for the last loan of about £9500, making in all £42,500, having been authorized at a special meeting, is now all but complete. Mr. Hawksley, C.E., is the engineer, and under his direction a new brick sewer from the lowest part of the existing system has been constructed to the Ham at Old Windsor, adjoining the Windsor Castle Sewage Farm, crossing the navigable cut of the Thames at Old Windsor, the distance being about two miles. Tanks have been constructed at the Ham, where it is intended to treat the sewage by precipitation, the effluent water to be disposed of by filtration. At the meeting held last Tuesday the committee under whose direction the work has proceeded, presented their final report, which stated that negotiations had been entered into with Mr. F. Hillé, and the town council decided to adopt his system for the treatment of the sewage, subject to the preparation of the necessary contracts. It was stated that Mr. Hillé's system was the cheapest to work which the committee had investigated. It is expected that, in the course of a very short time, the further purification of the Thames will be effected by the entire diversion of the Windsor sewage. At a recent meeting of the town council, it transpired that the costs of the prosecution of the Windsor Town Council by the Thames Conservators had amounted to £137.—*The Times*.

GRANTHAM WATER COMPANY.—The seventh half-yearly meeting of this company was held on Friday, the 3rd inst.—Mr. Lawrence Ridge in the chair—when the following report was presented:—"The directors beg to lay before the shareholders the accounts for the half year ending the 30th of June, which show a sum of £2742 12s. 11d. upon the revenue account available for dividend. It is proposed to apply £2400 of the above sum to the payment of a dividend at the rate of 8 per cent. per annum upon the capital of £30,000, leaving a balance of £342 12s. 11d. to be carried forward to the next account. Your directors have pleasure in noticing that the hopes entertained by them in recommending the shareholders to sanction the construction of new machinery at Salter's Ford have been fully realized; the consumption of coal alone, as compared with the corresponding half year of 1876 has resulted in a saving to the company of 198 tons 6 cwts. in the half year. In conclusion, your directors have the gratification of reporting the satisfactory state of the whole of the company's works, which continue in a thorough state of efficiency." The chairman pointed out that the receipts showed an increase in the amount of business done, while the works had been conducted in a very economical manner. By the new machinery alone a saving of £190 in the half year had to be recorded. The company's affairs were in such a satisfactory condition that the directors felt justified in increasing the proposed dividend from 7 to 8 per cent. He moved that the report and statement of accounts be adopted, which was seconded by Mr. J. G. Thompson, who explained that the increased consumption arose chiefly among private consumers, which was deemed a very satisfactory circumstance. The report was unanimously adopted, and the chairman's able services in behalf of the company were warmly acknowledged. In response, he referred to the assistance received from his brother directors, and to the efficient management of the company's engineer.

GRANTHAM GAS COMPANY.—The sixth ordinary general meeting of this company was held on the 3rd inst.—Mr. J. F. Burbidge in the chair. The report for the half year ending June 30 says: "Notwithstanding the reduction made in the price of gas in July last year, your directors are happy to say that in consequence of increased consumption arising from the extension of the town, as well as from the great ability and attention shown by Mr. Barratt, the manager of your works, to the economical working of all details, the financial condition of the company bears a favourable comparison with the previous year, and enables your directors to recommend a dividend of 10 per cent., free from income-tax; and they have the further gratification of informing consumers of gas that the price of gas has been further reduced from the 1st day of July last, from 4s. 7d. to 4s. 2d. per 1000 feet. The directors take this (the very earliest) opportunity of informing their shareholders that all matters between themselves and the town council are in a fair way of being amicably arranged." The revenue account showed a balance in favour of the company of £3275 6s. 5d. The chairman, in a brief address, said the works were in a capital state, and managed as economically, he believed, as they could be. He had great hopes that they would continue to go on prosperously, and if this were the case, it might perhaps be possible to again reduce the price of gas. He moved that the report and statement of accounts be adopted. Alderman Boyall, in seconding the motion, said he was exceedingly glad to hear the remarks of the chairman, and to read the report. He only hoped that if the price of coal continued as now, and with an additional consumption, they might, as the chairman hinted, look forward to the time when there would be a further reduction in the price of gas. The chairman remarked that a reduction of price was certainly their aim, but they must be governed by circumstances. On the motion of the chairman, seconded by Alderman Ridge, a dividend of 10 per cent. was agreed to. A cordial vote of thanks to the chairman concluded the business. The chairman said they had a manager who understood his work, and by laying their heads together they might do something to assist the town. They would have to travel a long way before they would find a better manager than Mr. Barratt.

London Sanitary Association.—The *Journal d'Hygiène* of Paris publishes a report of the meeting of this association, of which the following is a translation:—"On the 5th of July the delegates of the Society of Health assisted at an important meeting of the Sanitary Institute, under the president, his Grace the Duke of Northumberland. All the seats were occupied by an assembly both numerous and select. Round these great authorities of Britain were grouped the following gentlemen:—Sir Joseph Bazalgette, Messrs. William Farr, Lawson, Tait, Corfield, Collins, Lush, Chammont, Magnus Ohren, &c., &c. After a few words of welcome to the president of the French delegates (who were received with great applause), business began. Dr. Richardson then read his address. For more than an hour this talented author captivated the attention of his listeners by his elegant and animated language, his clear, precise arguments, and his explanation of sanitary formulæ, and the facts which he deduced from them. M. Marié Davy, our kind chief, read the address of thanks sent by our Sanitary Society to the Duke of Northumberland, signed by all the members of the *bureau*, and by two of our most eminent and honourable members—M. Henri Roger and the Baron Sorry. For want of time and space, we cannot describe the splendid banquet that was given to us at 'Grosvenor Restaurant.' The entertainment continued for three hours, brightened by eloquence of heart and soul. Dr. Richardson gave as a toast, 'The French Society of Health,' and M. Marié Davy replied in the following words: 'Ladies and Gentlemen,—Permit me to express how much I regret that I cannot tell you in your own language how much we are touched by your cordial welcome. Every conquest that we make in the domain of health is a conquest for all nations, and both in France and England rapid strides are being made in this conquest of difficulties. Most cordially, then, I drink to the prosperity of the Sanitary Institute, and to the continued success of our united efforts.' Miss Rose Adams, secretary to The Ladies Sanitary Association, has given us three beautiful volumes of tracts. Many of these pamphlets are ornamented with engravings and drawings. Some of them are written in verse. The value and practical importance of these documents seem to us to establish undeniable facts connected with sanitary subjects. Without other comments, we recommend them to the special notice of our great potentates of public administration."

Register of New Patents.

APPLICATION FOR LETTERS PATENT.

2881.—Bickerton, S. and H. N., Ashton-under-Lyne, Lancs, "A new or improved water-meter." July 28, 1877.
2933.—Lake, W. R., Southampton Buildings, London, "Improvements in portable apparatus for lighting gas." A communication. July 31, 1877.
2943.—Tyer, E., Finsbury, London, "Improvements in float-valves for cisterns." Aug. 1, 1877.
2944.—Fathers, J., Wales, York, "Improvements in water, steam, air, and other similar valves or cocks, the said improvements having reference to the spindles, covers, and packing thereof." Aug. 1, 1877.
2961.—Gedge, W. E., Strand, London, "An improved faucet or cock." A communication. Aug. 2, 1877.
2987.—Hill, C., Exeter, Devon, "Improvements in apparatus to be used in connexion with Argand burners." Aug. 4, 1877.
3003.—Tabrar, G., Strand, London, "Improvements in galleries for gas and other lamp glasses." Aug. 7, 1877.
3007.—Shone, I., Wrexham, Denbigh, "Improved a pparatus for raising and forcing water or other liquids." Aug. 7, 1877.
3011.—Conradi, H., Golden Square, London, "An improved universal syphon pump." A communication. Aug. 8, 1877.
3019.—Bonnefin, F. A., King's Cross, London, "Improvements in apparatus for filtering liquids, and separating solid matters therefrom." Aug. 8, 1877.
3020.—Sarjeant, E., Balsall Heath, Worcester, "An improvement or improvements in taps or cocks." Aug. 8, 1877.
3024.—Mills, E. C., and Haley, H., Manchester, "Improvements in motive-power engines worked by the explosion of gas." Aug. 8, 1877.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

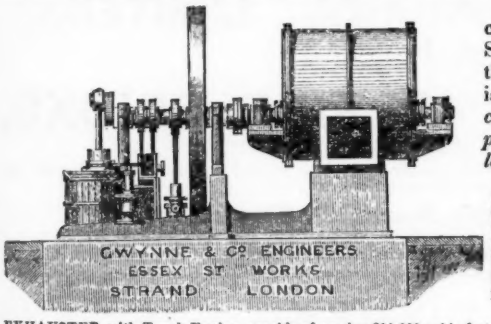
601.—Nawrocki, G. W. von, Berlin, Germany, "Improvements in water-meters." A communication. Feb. 14, 1877.
2105.—Redwood, T., Lower Clapton, and Redwood, T. B., North Finchley, "Improvements in the manufacture of gas for burning." May 30, 1877.
2281.—Pitt, S., Sutton, Surrey, "Improvements in machines for charging and discharging gas or other similar retorts, and for measuring the coal which is to be deposited in such retorts, and in arrangements for operating these contrivances." A communication. June 12, 1877.

PATENTS WHICH HAVE BECOME VOID
BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2495.—Newton, W. E., "Improvements in the manufacture of inflammable gas for illuminating and other purposes, and in the apparatus to be used therein." July 16, 1874.
2520.—Johnson, J. H., "Improvements in the separation of ammonia from illuminating and other gases." July 18, 1874.
2526.—Straten, E. V., "Improvements in apparatus for the combustion of air and gas for heating purposes." July 18, 1874.
2563.—Clark, A. M., "Improvements in steam-pumps." July 22, 1874.
2569.—Newton, W. E., "Improvements in gas-burners." July 22, 1874.
2605.—Wise, W. L., "Improvements in stop-valves." July 25, 1874.
2618.—Gaukroger, J., Fielden, S., and Aitchison, A., "Improved apparatus for generating gas for lighting, heating, and cooking." July 27, 1874.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, and TWO MEDALS at the PHILADELPHIA EXHIBITION. have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

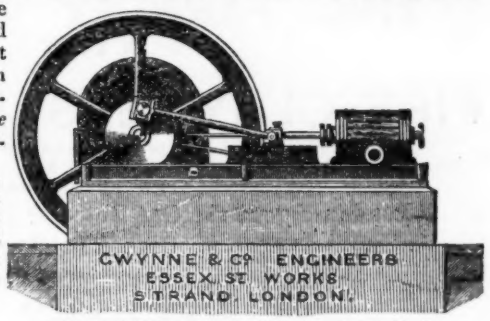
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—"*Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship.*"

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 7,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas without oscillation or variation in pressure. Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

☞ *G. & Co. are now making 6 Sets Exhausters and Engines for 105,000 cubic feet per hour, 3 Sets 180,000 Exhausters and Engines, with many others of all Sizes.*

NOTICE OF REMOVAL.

D. BRUCE PEEBLES & CO.

Beg to announce that they have REMOVED to their New Premises,

TAY WORKS, BONNINGTON, EDINBURGH,

To which all communications should now be addressed.

May 30, 1877.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

District Office: 97, NEW STREET, BIRMINGHAM; Agent: W. M'GOWAN;

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.

TO BE SOLD CHEAP, the undermentioned GAS APPARATUS, taken down to erect larger:—Hydraulic Main for five and three Retorts; Condenser, with chest and ten 4-in. Vertical Pipes; Washer, 6 ft. by 3 ft.; Scrubbers, 6 ft. by 2 ft.; Two Cast-Iron Purifiers, 4 ft. by 4 ft. by 3 ft., all complete, with valves and 4-in. connexions; Station-Meter; Gasholder, 24 ft. by 10 ft., with columns, &c., complete.

All the above are in working order, and will be put on Great Eastern Railway ready for re-fixing. No reasonable offer will be refused.

J. BARKER, Jun., Secretary.
Gas Company, Framlingham, Suffolk.

FOR SALE—Two Purifiers, 6 ft. square, 3 ft. deep, fitted with two 10-in. four-way valves and 10-in. connexions, with covers, wood grids, and columns and girders for lifting lids; also three 10 ft. square PURIFIERS, 5 ft. deep, with covers, wood grids, 10-in. centre-valve, 10-in. connexions, and columns and girders for lifting lids.

Apply to the SECRETARY AND MANAGER, Gas-Works, Bromley, KENT.

GASHOLDER FOR SALE.

ONE Telescopic Gasholder, 70 feet by 20 feet, complete, with cast-iron tank, columns, girders, and inlet and outlet pipes, valves, &c., of modern construction. In first-class condition, and made by Messrs. Piggott and Co., of Birmingham.

To be seen at work at the Gas-Works, Birkenhead.

Cause of removal to make room for extensions.

To be sold a bargain, taken down, and re-erected ready for work.

For particulars, apply to Messrs. ASHMORE AND WHILE, STOCKTON-ON-TEES, or to view to Mr. CALLOW, Gas Engineer, BIRKENHEAD.

FOR SALE—One Exhauster by Jones, of Birmingham, capacity 25,000 feet per hour, with bye-pass, 12-in. inlet and outlet pipes and valves complete, in first-class working condition, price £40; also one Exhauster Regulator, with chain and weights complete, price £5.

Apply to CLAPHAM BROS., Ironfounders, &c., Keighley, YORKS.

PATENT FUEL AND LIME FOR PURIFYING FROM FOUL LIME.

By a simple process the Foul Lime is converted into Fuel, by the combustion of which the lime is reproduced as a purifying agent.

Licences to work the invention will be granted to Gas Companies on very reasonable terms.

For further particulars apply to Mr. E. MADDOCKS, Manager of the Gas-Works, KETTERING.

The adoption of the above invention, without a licence from the Patentee, will be an infringement of the patent, and will subject the person or company guilty of such infringement to legal process.

TO GAS COMPANIES.

WE beg to call attention to our special STEATITE BURNERS for Street Lamps. Sample gross 8s. Quotations for quantities.

Messrs. TINDALL AND TELLING, Gas Apparatus Works, 74, Wynford Road, Penton Street, LONDON, N.

EDWARD COCKEY & SONS,

GAS ENGINEERS, FROME SELWOOD,

MANUFACTURERS OF ALL DESCRIPTIONS OF

APPARATUS CONNECTED WITH GAS-WORKS.

THE ORIGINAL PATENTEES AND MANUFACTURERS OF THE

DRY-FACED VALVES

FOR PURIFIERS, GASHOLDERS, BYE-PASS, AND OTHER ARRANGEMENTS REQUIRING VALVES IN GAS-WORKS.

The Faced Valves, as made by the Patentees, continue to give great satisfaction, and they are being used extensively by many of the best gas engineers of the day.

They are more easily repaired than any other kind of Valve in use, and can be re-ground in a few hours without removal, and made perfectly gas-tight.

References can be given to many Engineers of high standing, who will testify as to the favour in which they are held.

MANUFACTURERS ALSO OF SUPERIOR WOOD GRIDS FOR PURIFIERS, SCRUBBERS, &c.

THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS & FIRE-BRICKS,

Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.

In order to meet the constantly increasing demand for their Gas-Retorts, the F. I. Co. have recently made such an addition to their premises as will enable them to execute expeditiously the largest home or foreign orders.

London Agent for Gas-Retorts: D. W. OGG, 3, Jeffrey's Square, St. Mary's Axe, E.C.
" " Glazed Bricks: A. BARFIELD, 22, Great George Street, Westminster.

LIVESEY FIRE-CLAY WORKS.

NEAR BLACKBURN, LANCASHIRE.

(ESTABLISHED 1835.)

ORLANDO BROTHERS, LIMITED,

MANUFACTURERS OF PATENT CLAY RETORTS,

AND EVERY DESCRIPTION OF

TUBULAR GLAZED SEWERAGE PIPES, BENDS, JUNCTIONS, ETC.

FIRE-BRICKS, TILES, BLOCKS, AND CHIMNEY-TOPS

GAS PURIFICATION & CHEMICAL Co., LIMITED.

(Successors to JOHN WILLIAM O'NEILL & CO.,)

Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL,
SAMUEL H. JOHNSON, } Joint Managing Directors.

Now ready, price One Shilling, No. 9 (to be continued Monthly) of

A TREATISE ON THE SCIENCE & PRACTICE
OF THE
Manufacture and Distribution
OF
COAL GAS.

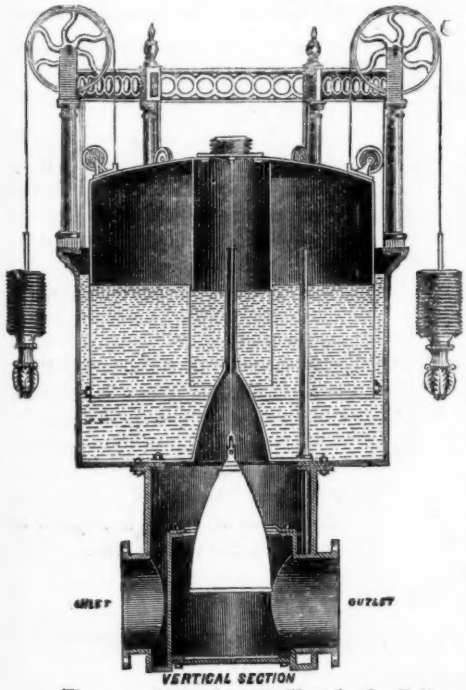
LONDON: WILLIAM B. KING, 11, BOLT COURT, FLEET STREET,
OR OF ANY BOOKSELLER IN TOWN OR COUNTRY.

Now ready.

THE GAS & WATER COMPANIES DIRECTORY
FOR THE YEAR 1877,
EDITED BY
CHARLES W. HASTINGS,
8, BUCKINGHAM STREET, ADELPHI, LONDON, W.C.
THIS WORK IS UNDER THE PATRONAGE OF ALL THE LEADING GAS & WATER ENGINEERS AND SECRETARIES OF THE METROPOLITAN & PROVINCIAL COMPANIES.
Price 5s. in Cloth Covers; by post, 5s. 2d. | Price 3s. 6d. in Paper Covers; by post, 3s. 8d.
PUBLISHED BY MESSRS. MARCUS WARD & CO., OF LONDON AND BELFAST.

J. EDMUNDSON & CO.,
19, GREAT GEORGE STREET, WESTMINSTER,
LONDON, S.W.,
MANUFACTURERS OF EVERY DESCRIPTION OF
GAS APPARATUS.
CONTRACTORS FOR THE
ERECTION OF GAS-WORKS, GAS-FITTINGS, &c.,
FOR TOWNS, COUNTRY MANSIONS, &c.
Estimates given free of Charge.

J. & J. BRADDOCK,
GLOBE METER-WORKS,
OLDHAM,
Beg to submit to Gas Engineers their
PATENT COMPENSATING GAS GOVERNOR,
Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 24-inch Mains, and give most satisfactory results.

They can be made with Float in the Bell, or counterpoise as per section.

THE MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.
INCORPORATED BY ACT OF PARLIAMENT, 1867.

NOTICE is hereby given that the TWENTY-FIRST ORDINARY HALF-YEARLY GENERAL MEETING of the SHAREHOLDERS of this Company will be held in the Board-Room at the Works, Mitcham, in the County of Surrey, on TUESDAY, the 28th day of August, 1877, at Three o'clock in the afternoon precisely, to declare a Dividend for the half year ending the 30th day of June, 1877.

The Transfer Books will be closed from the 13th until the 28th inst.

By order,
BENJAMIN GREEN, Secretary and Manager.
Board-Room, Mitcham, Surrey, Aug. 8, 1877.

BARNET DISTRICT GAS & WATER COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the PROPRIETORS of the above Company will be held at the Guildhall Tavern, Gresham Street, in the City of London, on FRIDAY, the 31st day of August inst., at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the half year ending the 30th day of June last, to declare a Dividend, and to transact the general business of the Company.

The Transfer Books will be closed from the 17th to the 31st inst., both inclusive.

By order of the Board,
ALFRED LASS, Secretary.
Offices, 30, Gracechurch Street, London, E.C.,
Aug. 3, 1877.

TO GAS MANAGERS.

WANTED, by the Newry Gas Consumers Company, Limited, a GAS MANAGER, at a salary of £150 a year, with residence, coal, and gaslight.

Applications in every case to be accompanied by testimonials, and results of previous management, addressed to me at the Office of the Company, not later than Wednesday, the 22nd of August inst.

CHARLES ARMSTRONG, Secretary.
Offices and Works, Kilmorey Street, Newry,
Aug. 8, 1877.

WANTED immediately, several steady, experienced GAS-FITTERS, also a Main and Service Layer, for a country Gas-Works.

Apply, stating wages required, with references, to Mr. J. T. HALL, Prescot, LANCASHIRE.

WANTED, a Working Manager for a very small Gas-Works in North Wales. Must thoroughly understand making and purifying gas, laying mains, services, and fixing meters. House, coal, and gas.

Apply, stating wages required, with references, to Z., care of Mr. G. W. Hughes, 4, Cable Street, LIVERPOOL.

WANTED, a good Draughtsman; one who has been accustomed to Building and Iron-work. Salary £2 per week.

Apply, by letter, before the 16th inst., stating past employment, to No. 396, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A Respectable, middle-aged, practical Man is open to a situation as MANAGER over a Small Gas-Works, Foreman, or Meter Inspector. Is well up in laying mains, services, or fittings of any kind.

Address No. 395, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Drighlington and Gildersome Gas-light Company require a person thoroughly competent to perform the duties of MANAGER and SECRETARY of their Gas-Works at Drighlington, at a yearly salary of £150, together with a house at the works, with coal and gas free. The person employed will have to devote the whole of his time to the duties of his office, and must have had practical experience in the varied duties appertaining to such a position.

Applications, endorsed "Manager and Secretary," stating age, qualification, and present employment, together with testimonials of character and ability, to be sent to the undersigned, on or before the 21st day of August inst.

By order,
CHAS. ARMITAGE, Manager and Secretary.

GUILDFORD GASLIGHT AND COKE COMPANY.

THE Directors are desirous to appoint forthwith a person competent to perform the duties of MANAGER, Secretary, and Collector to this Company. Yearly salary £250, with house at works, rent free, and coals and gas free. He must be thoroughly acquainted with his duties, and be prepared to devote the whole of his time to them, and will have to give a bond in £1000, with sureties, to be approved by the Directors, for the due performance of them, and for his collecting. He will have assistance in the book-keeping and collecting.

Applications, stating age, qualifications, and present employment, with testimonials of character and ability, to be sent to J. R. CAPRON, Esq., GUILDFORD, Chairman of Directors, on or before Aug. 24, 1877.

WANTED, the Address of Gas Officers who have not received a Copy of the New Edition of PAMPHLET for GAS COMPANIES to distribute to their Gas Consumers—"Cooking and Heating by Gas." A Copy will be sent free—extra Copies by post Threepence—direct from the Author, MAGNUS OHREN, Gas-Works, SYDENHAM, S.E.

REQUIRED, a competent Gas-Fitter and REPAIRER of METERS. None need apply whose character will not bear strict investigation. Wages 28s. per week, overtime paid.

Applications to be made by letter, addressed No. 391, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, to Lease a Small Gas-Works, making from 2 to 6 millions per annum. Midland Counties, Stafford, Derby, or Leicester, preferred.

Address No. 393, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TAR.

OFFERS are requested for the Surplus TAR (more or less, 25,000 gallons) made at the Aldershot Gas-Works for the year from the 1st of October next until Sept. 30, 1878.

Address, till 30th inst., stating price per gallon in purchaser's barrels, received in trucks at Tongham or Aldershot Station, South-Western Railway, or Ash Station, South-Eastern Railway, to Messrs. WILSON AND DOUGLAS, Gas and Water Offices, ALDERSHOT.

TAR AND AMMONIACAL LIQUOR.

THE Andover Gas and Coke Company require TENDERS for their surplus TAR and AMMONIACAL LIQUOR for a term. Will be put free on the South-Western Rail at Andover Town Station. Casks to be provided by the Contractors.

Application for information and tenders to be sent to Mr. S. SHAW, Andover, by the 1st of September next.

Andover, Aug. 9, 1877.

SPENT OXIDE.

A Quantity of Spent Oxide for Sale. For particulars, apply to A. H. WOOD, Engineer, Gas-Works, HASTINGS.

TENDERS FOR TAR.

THE Directors of the Cork Gas Consumers Company are prepared to receive TENDERS for their surplus TAR, for One year from the 1st of September next. The quantity for sale will be about 150,000 gallons, and will be delivered at the Company's Works, or by tank trucks into vessels at quay near works.

Any further information can be obtained by application to the Secretary, to whom tenders must be forwarded not later than the 5th of September next.

By order,
DENNY LANE, Secretary.

Cork Gas Consumers Company,
Offices, 72, South Mall, Cork, Aug. 11, 1877.

WANTED to Purchase, 15,000 Gallons of TAR, delivered in buyer's barrels at Newmaket Railway Station, Great Eastern Railway. Cash on delivery.

Address Mr. Thomas Wilkinson, Harwood Villa, NEWMARKET.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Winchester Water and Gas Company are prepared to receive TENDERS for the purchase of the AMMONIACAL LIQUOR and surplus TAR produced at their Works for a period of One year, commencing on the 14th day of September next.

Particulars and forms of tender may be obtained on application.

Tenders to be sent in addressed to the Manager, and endorsed "Tender for Tar and Liquor," on or before Monday, the 3rd day of September.

TO IRONFOUNDERS.

THE Oldham Corporation Water-Works Committee are prepared to receive TENDERS for supplying about 900, 28-inch Cast-Iron SOCKET-PIPES; 650, 26-inch ditto, and a quantity of Branches, Bends, and other special Castings.

Particulars may be obtained on application to Mr. HERBERT ANDREW, Gas and Water Offices, Oldham.

Tenders to be sent in on or before Tuesday, Aug. 21.

By order,
H. BOOTH, Town-Clerk.

Oldham, July 27, 1877.

WIDNES GAS-WORKS.

THE Widnes Local Board invite Tenders for the purchase of the GAS TAR and AMMONIACAL LIQUOR produced at their works for a term of Twelve months from the 1st of October next.

Tenders, endorsed "Tar" or "Liquor," as the case may be, and addressed to the Chairman of the Gas and Water Committee, to be delivered at the above works (where conditions of contract can be obtained) not later than 10 a.m. upon the 30th of August.

The Board do not bind themselves to accept the highest or any tender.

HENRY ROBERTS.

Public Offices, Widnes, Aug. 8, 1877.

NOTICE.

MESSRS. THOMAS DOCWRA & SON, Contractors, Balls Pond Road, hereby give notice that they have no business connexion with any other person of the same name.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

CATHELS'S Patent District Dry Gas- GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

CATHELS & TERRACE'S Patent Four- WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

CATHELS'S Improved Retort-Settings. Guaranteed to heat and wear well, with great economy of Fuel.

Coloured lithograph copies of Working Drawings of Beds of One to Seven Retorts (so clearly arranged and fully shown as to be easily understood by any retort setter or bricklayer) having been made of these valuable settings, they can now be supplied with detailed Specification immediately on receipt of orders.

Apply to Mr. THOS. NEWBIGGING, Consulting Gas Engineer, 5, Norfolk Street, MANCHESTER.

S. OWENS & CO.,

WHITEFRIARS STREET, LONDON, E.C.,

HYDRAULIC ENGINEERS,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT STEAM-PUMPS,

More than 10,000 in use,

ESPECIALLY ADAPTED FOR USE IN GAS AND CHEMICAL WORKS, FOR PUMPING TAR, WATER, AMMONIACAL LIQUOR, ACIDS, &c.

The following are some of the prominent advantages of the BLAKE PUMP:—

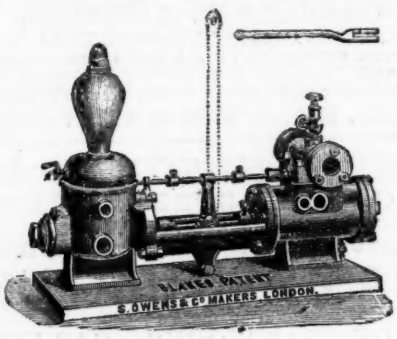
It will start at any point of stroke.

It has no dead point.

It works fast or slow, with the same certainty of action.

It is economical. Has a lead on the slide-valve.

It is compact and durable.



It is interchangeable in all its working parts.

It will deliver more water than any other pump.

It is made of best materials in the most workmanlike manner.

Can be worked at 20 strokes per hour, or 200 strokes per minute.

This Illustration represents Boiler-Feed Pumps, Sizes Nos. 1, 2, and 3, with Hand Lever for working Pump when Steam is not available.

SOLE MANUFACTURERS OF

MANN & OWENS
IMPROVED PATENT GAS-VALVES.

PRICED LISTS AND FULL PARTICULARS FURNISHED ON APPLICATION.

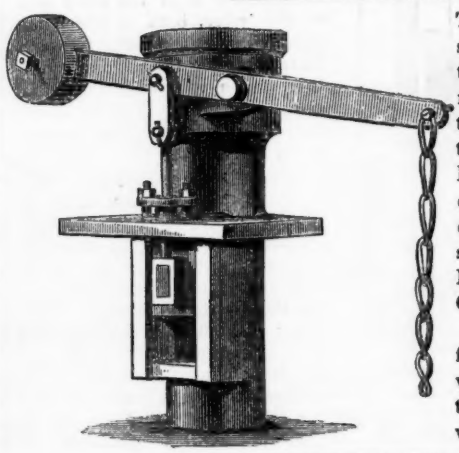
JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

MOORE'S PATENT DIP-PIPE.



THE advantages of this Dip will be seen from the engraving. It is thoroughly effectual in its working, removing the whole of the pressure of the hydraulic main from the retort, thus causing a great saving in gas. It is very easy of manipulation, requiring little care and attention; it cannot get out of order, and, when shut, works as an ordinary Dip-Pipe. No accumulation of carbon in retort. Can be fixed to existing H-pipes.

In ordering the Dip, the distance from top side of hydraulic main to water-level should be stated; also the Dip at which it is required to work when the valve is shut.

PRICES—3-in., 35s.; 4-in., 42s.; 5-in., 48s.

SOLE AGENT: J. GILL, GAS-WORKS, BRIDGENORTH,
To whom all communications should be addressed.
MAKERS: THE COALBROOKDALE COMPANY, SHROPSHIRE.

PATENT HYDRAULIC LIFTS, CRANES, HOISTS,

Suitable for Lifting Purifier-Covers, &c.

S. CLAYTON & CO., BRADFORD, YORKS.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

BRAZILIAN IRON-WORKS, MALTON, YORKSHIRE.

THOMAS READ & CO.,

General Ironfounders and Manufacturers

OF

GAS AND WATER SOCKET-PIPES,

2-inch to 8-inch, can supply from Stock.

LONDON AGENT:

J. MYERS, 5, FORTESS TERRACE WEST, JUNCTION ROAD, N.W.

GAS PURIFICATION.

BAILES & HALLSWORTH,

CONTRACTORS FOR THE

PURIFICATION OF COAL GAS,

BY THEIR

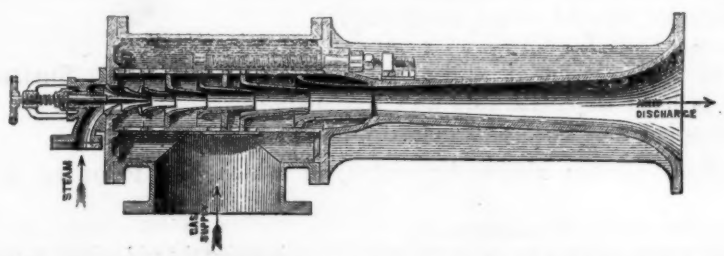
PATENT OXIDE OF IRON COMPOUND.

The material is in use at most of the principal Gas-Works in Yorkshire and elsewhere. It contains considerably less moisture than natural Oxide of Iron. It is much cheaper and more efficient as a purifying agent.

B. & H. are purchasers of Spent Oxide, or will take Spent in exchange for New Material.

FOR SAMPLES AND TERMS, ADDRESS—

BAILES & HALLSWORTH, COPPERAS WORKS, ARMLEY, LEEDS.



KÖRTING'S STEAM-JET GAS-EXHAUSTER.

IMPROVED CLELAND'S PATENT.

UPWARDS OF 250 IN USE.

CLELAND'S PATENT CONDENSER AND STEAM SCRUBBER.

FOR PARTICULARS, APPLY TO

KÖRTING BROS.,

17, LANCASTER AVENUE, MANCHESTER,

OR TO

GERALD J. TUPP, 8, John Street, Adelphi, W.C.,

LONDON,

SOLE AGENT FOR ENGLAND AND WALES.

BOUCK & CO., LIMITED,

TAR DISTILLERS & MANUFACTURING CHEMISTS,

MILES PLATTING, MANCHESTER.

BUYERS OF COAL TAR,

And Crude Products therefrom,

AMMONIACAL LIQUOR, &c.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

ENGINEER,

AND

CONSULTING GAS ENGINEER,

BARTON HOUSE, opposite BARTON ARCADE,

DEANSGATE, MANCHESTER.

ALFRED LASS,

SPECIAL ACCOUNTANT FOR GAS COMPANIES,

30, GRACECHURCH STREET, LONDON.

Accounts analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by A. L. to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, and have been universally approved.

The above forms are registered.

Water Companies Accounts also prepared and adjusted.

CONSULTATIONS.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c, supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

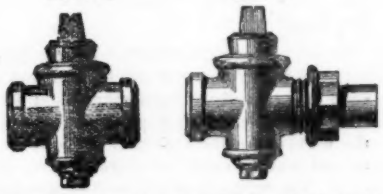
LAMBERT'S

CAST-IRON GAS-MAIN COCKS,

WITH PATENT WHITE METAL PLUGS.

TRADE (L) MARK.

No. 758. No. 759.



The bodies of these Taps are made of iron, black or galvanized, and the plugs of patent metal. They are warranted not to set fast or corrode, as do Iron or Brass Cocks; will always work easily; are strong, well made, durable; of little or no intrinsic value, and therefore not likely to be stolen; and the prices as stated below are (especially upon the larger sizes) fully 50 per cent. less than Brass Cocks.

	½	¾	1	1¼	1½	2-inch.
No. 758, with inside screws for iron pipe, black	2/0	3/0	4/1	6/6	7/6	12/0 each.
No. 759, with union on one end screwed inside for iron pipe, black	2/9	3/10	5/1	8/0	9/0	15/6 each.
Nos. 758 and 759, galvanized	0/3	0/4	0/6	0/8	0/10	1/4 extra.

MANUFACTORY:

SHORT STREET, LAMBETH, LONDON.

THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS,
&c., &c.,
SCOTSWOOD FIRE-BRICK WORKS,
SCOTSWOOD-ON-TYNE.

HEBBURN MAIN GAS COALS.

T. Stone, Esq., of Weymouth, writes on Nov. 17, 1876: "I have used about 12,000 tons of this Coal, with, I think, the best possible results, although not always under the most favourable circumstances. My Coal account made up to Midsummer last showed a makeage of 10,524 cubic feet per ton of 14¼-candle gas, and not a hundredweight of Cannel used. This statement would, I know, be incredible to many men, and may provoke the remark, 'How much of it is paid for?' For the gratification of such, I have to say that, of the above quantity, 9866 cubic feet per ton of Coal carbonized were brought to charge and duly paid for, with the exception of about 6s. per cent. for bad debts. The coke is of excellent quality. The above facts I hold to be a greater recommendation to your Coal than any words of mine could be."

THE TYNE COAL COMPANY, LIMITED, OWNERS.
W. RICHARDSON, Fitter,
29, QUAYSIDE, NEWCASTLE-ON-TYNE.

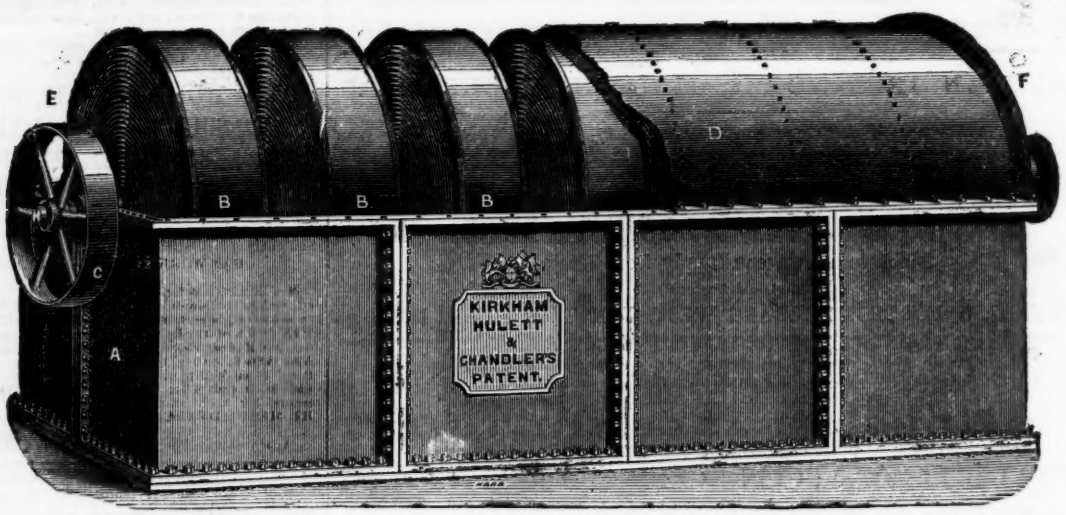
J. T. B. PORTER & CO.,
GAS ENGINEERS & MANUFACTURERS,
IRONFOUNDERS AND CONTRACTORS,
GOWTS BRIDGE WORKS,
LINCOLN.

LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.
REFERENCES TO 500 WORKS ALREADY ERECTED.

N.B.—All Communications to be addressed to the FIRM ONLY.

STANDARD WASHER AND SCRUBBER.



The advantages of the Apparatus will doubtless be understood by those interested in gas manufacture.

The principal points of any Apparatus for the extraction of ammonia may be summarily stated as follows:—

1. **A large amount of Surface is desirable.**
2. **Such Surface should be always effectually Wetted.**
3. **The Surfaces or Scrubbing Material should cause no Pressure.**
4. **The Gas should meet various strength Liquors on its course.**
5. **However small the quantity of Water used, it ought to operate over the whole Surface.**
6. **Changing Scrubbing Material is both Objectionable and Expensive.**
7. **Economy both as to Space occupied and Cost of Apparatus is an important item.**

All these requisitions are supplied by the above Apparatus, of which the following is an explanation:—

A is a cast-iron tank, formed into several separate water-tight compartments.

B B B volutes of sheet iron fitted to the centre shaft, which is driven by the pulley, C, and causing the said volutes to revolve each in a separate compartment filled with water or other fluid.

D, the cover, has partitions fitted into it corresponding with those in the tank, sufficient space being left between the top of the partition in the tank and the lower edge of that in the cover, to allow the gas a free passage through the first volute to the second, and so on to the third, fourth, &c.

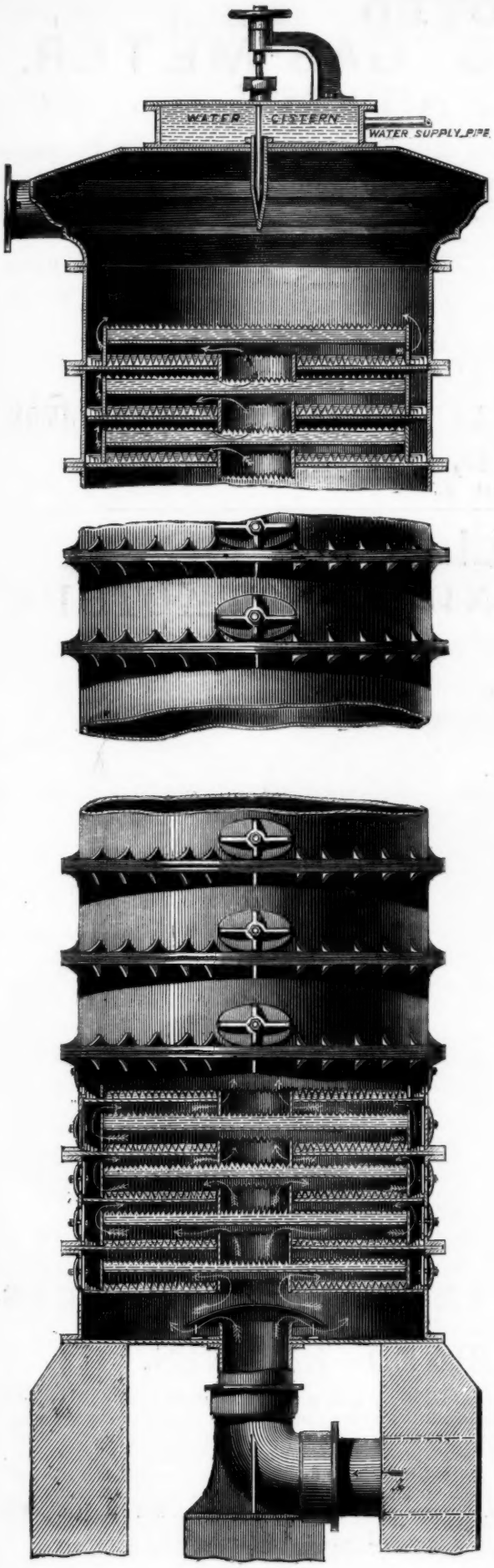
The action is as follows:—The crude gas entering at E is partly washed in the first compartment, which becomes 10 or 12 oz. liquor, or stronger if required, according to the quantity allowed to enter per ton; the gas then passes to the second, where the liquor is of a less strength; thence into a weaker liquor, as it passes from one compartment to the other, finishing at the last compartment or outlet, F, with clean water, which is constantly flowing and running over from one compartment to another, until it reaches the last space, from which it flows from the outlet-pipe into the well or tank ready for sale or removal.

Taps are inserted in each compartment for the convenience of drawing liquor for testing, &c.

Applications as to Cost, &c., may be obtained of either

Mr. D. HULETT, 55 & 56, HIGH HOLBORN;
Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER;
Or Messrs. CHANDLER, 104, NEWINGTON CAUSEWAY.

Inquirers will please state their Maximum Day Make.



SAMUEL CUTLER & SONS

CONTRACTORS FOR GAS & WATER WORKS,
GENERAL ENGINEERS, IRONFOUNDERS,
AND
MANUFACTURERS OF

Gasholders, Tanks, Purifiers,

SCRUBBERS, VALVES, EXHAUSTERS,

IRON ROOFS,

BRIDGES, BOILERS, AND GENERAL CAST AND WROUGHT IRON WORK.

S. C. & Sons undertake the entire Erection of New, or Remodelling of existing Gas-Works in any part of the World, including small Works for MANSIONS, FACTORIES, &c., or Works of the largest extent (are now constructing the largest Gasholder yet erected); also the Supplying and Laying of MAINS.

They make a speciality of supplying every requisite whatever for a Gas-Work, keeping in Stock what are most in request. WOOD SIEVES for Purifiers and Scrubbers, of a superior make.

SPECIAL CASTINGS to Drawing or Pattern at Shortest Notice.

MANUFACTURERS OF

CUTLER'S

PATENT GAS-WASHER

AND

MORRIS & CUTLER'S

PATENT CONDENSER.

(For Illustration and Description, see next "Journal.")

DESCRIPTION OF CUTLER'S PATENT GAS-WASHER.

The Washer consists of a vessel or tower of a cylindrical or other form, convenient to the site available for it. The interior is fitted with a number of dished trays arranged as shown, one above the other, from bottom to top. The flanges or sides of these trays are formed with serrated edges, and are arranged so that each tray contains a certain depth of water or liquor; the position and size of the serrated orifices in the dipping edges being such that the upper parts are slightly above the water, and so that the combined area of these small orifices is proportionate to the size of the inlet-pipe, the gas passing through without increase of pressure, and diffused in thinly divided streams. All the other edges are likewise serrated, so that the liquor passes over same in small streams, and so that the gas cannot pass through in bulk. The water or washing liquor is admitted at the top, the supply being governed by a conical needle regulating-valve so that the amount can be regulated to any desired quantity. The gas is admitted at the bottom and out at the top, the water or liquor descending the one meeting the other, and thus being brought into the very closest contact, and the gas consequently being deprived of its ammonia and other impurities absorbed by water or other liquor.

Where a slight increase of pressure is not of great consequence, we prefer to allow some of the lower tiers of trays to be slightly sealed, the better to arrest any tar or heavy oils that may have passed the condenser.

For further Particulars, apply to

S. CUTLER & SONS,

PROVIDENCE WORKS, MILLWALL,

(NEAR THE STEAMBOAT PIER,)

LONDON, E.

IMPROVED
COMPENSATING GAS-METER.
HUNT'S PATENT.

This Meter supplies a want long felt, by putting an end to the loss sustained by Gas Companies through the overworking of their Meters.

EXTRACTS FROM REPORTS.

"I am able to report that the Meters have given in each test most satisfactory results."—*Mr. H. Sporne, City of London Meter Inspector.*

"I consider the arrangement is a great improvement upon the Meters in present general use."—*Mr. T. Jackson, Meter Inspector, Birmingham.*

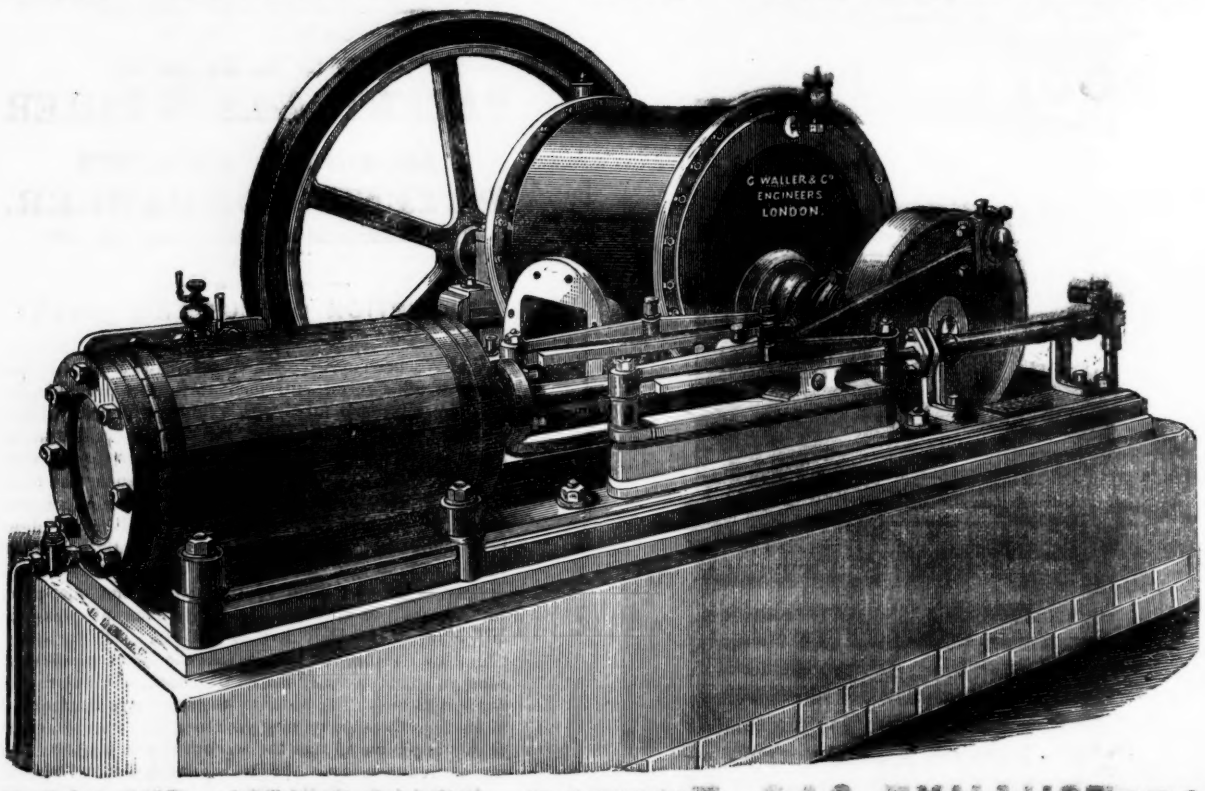
"I would observe from the results of my testings that the Meters are a great improvement on the ordinary Wet Meters in general use."—*Mr. H. Airey, Meter Inspector to the Metropolitan Board of Works.*

COPIES OF REPORTS SENT ON APPLICATION.

MANUFACTURED BY

JOHN BENT & SON,
WET AND DRY GAS-METER AND GAS APPARATUS MANUFACTURERS,
BELL BARN ROAD, BIRMINGHAM.
Established 1830.

GEORGE WALLER & CO.,
GAS ENGINEERS AND CONTRACTORS.



BEALE'S IMPROVED PATENT GAS-EXHAUSTERS
AND
HORIZONTAL COMBINED ENGINES.

This arrangement, specially designed and manufactured **solely by G. W. & Co.**, is suitable for Works making 10,000 cubic feet and upwards of gas per hour. The **Exhausters** are of **full capacity** for the quantity of gas to pass, have **wrought-iron spindles** to ensure perfect safety in working, the flanges of cylinders and edges of covers are turned, inlet and outlet flanges turned, faced, and drilled, and the base of each Exhauster is planed. The **Engines** have wrought-iron connecting-rods, with solid gun-metal ends, steel piston and slide rods, turned and polished discs, heavy fly-wheels turned on rim and edge and polished, cylinders are lagged with polished mahogany and brass bands, and the bed-plates are planed on the bottom surface. A heavy bracket and plummer block, with strong gun-metal bearings, support the shaft between the Exhauster and fly-wheel.

Disc Gas-Valves, Self-Acting Bye-Pass Valves, Hydraulic Main Valves, Pumps, &c., always kept in Stock.

Phœnix Engineering Works, Holland Street, Southwark, S.E.

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IRON AND BRASS FOUNDERS,

PARK WORKS, GATESHEAD-ON-TYNE.

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HYDRAULIC MACHINERY,

INCLUDING

ACCUMULATORS, FORCE-PUMPS, CRANES, & LIFTS,

FOR

GAS-WORKS, WAREHOUSES, &c.

IMPROVED HYDRAULIC MACHINERY,

Specially Arranged for Lifting and Lowering Purifier-Covers, &c.

MAKERS OF

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS;

PIPES FOR GAS AND WATER WORKS;

ROOFS, COLUMNS, AND GIRDERS.

DESIGNS AND ESTIMATES SUPPLIED ON APPLICATION.

THOMAS ALLAN & SONS,

IRONFOUNDERS,

WORKS:

SPRINGBANK FOUNDRY & NORTH WOODSIDE FOUNDRY,

GLASGOW;

BONLEA FOUNDRY, STOCKTON-ON-TEES,

Manufacturers of

CAST-IRON GAS AND WATER PIPES.

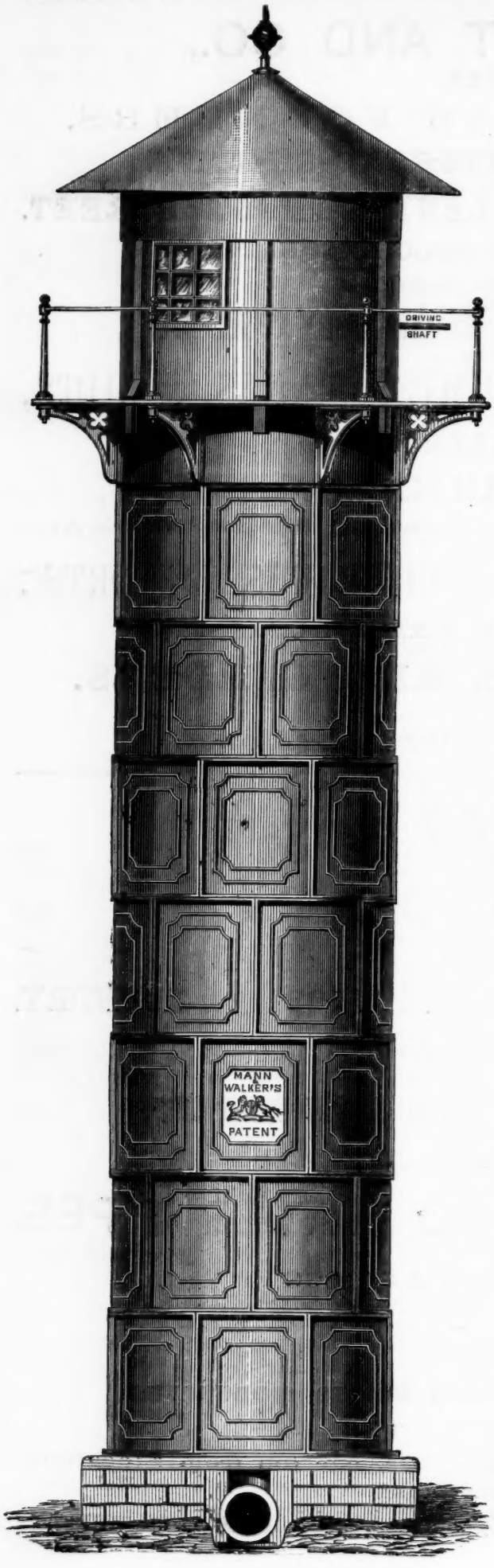
SIZES: ¾ to 12 inches at GLASGOW.

„ 1½ to 7 „ STOCKTON.

A LARGE STOCK KEPT, AND PRICES MODERATE.

Freight to London, in the Stream, 10s. per ton from Stockton; 12s. 6d. from Glasgow.

London Agent: Mr. A. C. FRASER, ST. STEPHEN'S CHAMBERS, TELEGRAPH STREET.



C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the important results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, the number in use exceeds **one hundred,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

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ESTABLISHED 1807.

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WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

TO GAS COMPANIES AND THE TRADE.

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MANUFACTURERS OF

CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.

A LARGE STOCK ALWAYS IN HAND OF

IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,

AND EVERY DESCRIPTION OF

GAS AND WATER FITTINGS.

THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.

STREET LAMPS AND COLUMNS IN GREAT VARIETY.

WORKS: LONDON AND BIRMINGHAM.

GAS MOONS,
Cut and Engraved, of the newest designs

GAS REFLECTORS
In Silver and Glass

GAS NIBS
AND
BURNERS
Of every description.

Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1876, are now complete.

City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.

ESTABLISHED 1830.

LESMAHAGOW CANNEL COAL.

FERRAND DAVIES,

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SOLE AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL.

Quotation and Analysis forwarded on application.

G. J. EVESON,

GAS COAL AND CANNEL FACTOR,

Has on offer, in quantities to suit purchasers, Best Wigan Arley Mine, Orrell Screened and Unscreened Gas Coal and Nuts; Best Yorkshire, Real Old Silkstone, Derbyshire, and North Staffordshire Screened and Unscreened Gas Coal and Nuts; also Best Lancashire, Yorkshire, Derbyshire, and other Cannel, as supplied to some of the principal Gas Companies in England, to whom references are permitted.

Analysis and Prices forwarded on application to

HEAD OFFICES, STOURBRIDGE.

N.B.—Gas Managers will oblige by advising when they will be prepared to receive Tenders.

STOURBRIDGE FIRE-BRICKS, RETORTS, CLAY, &c.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

173, ST. VINCENT STREET, GLASGOW.

SHOTT'S BOGHEAD.

LOTHIAN'S CANNEL

Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, NEAR LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or export Best Wigan Arley Gas Coal and Nuts; best qualities of the Derbyshire, Yorkshire, and North Staffordshire Gas Coals and Nuts; also the best descriptions of Lancashire, Welsh, Scotch, and other Cannel.

Messrs. WILSON CARTER & PEARSON, being contractors to several of the principal Gas Companies in the Midland Counties, have pleasure in being enabled to give them as references.

Chief Offices: Temple Buildings, 50, New Street, Birmingham.

London Offices: 6, Great Winchester St. Buildings, E.C.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING

MACHINE,

For 1 in., 1¼ in., 1½ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD,

LANCASHIRE.

ALBERT GAS COAL.

THE DERBYSHIRE

SILKSTONE COAL COMPANY,

LIMITED,

CAN OFFER A

GAS COAL

Of superior quality, delivered in trucks at any Railway Station in England, or shipped on board at Hull, Grimsby Docks, or Barrow-in-Furness.

Purified gas per ton of coal in cubic feet (average)	**10,262**
Illuminating power in candles	**15·86**
Weight of coke in lbs. per ton of coal	**1,502**

ANALYSIS AND PRICES ON APPLICATION TO

Mr. EDMUND TAYLOR, Secretary,

ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

THE SILKSTONE & DODWORTH COAL & IRON COMPANY, LIMITED,

DODWORTH, BARNSLEY.

BENJAMIN WHITWORTH, Esq., M.P. . . . . Chairman.
Mr. RICHARD HARTLEY . . . . . Managing Director.

REAL OLD SILKSTONE GAS COAL.

JAMES PATERSON, Esq., Gas Engineer, of the Warrington Gas Company, reported, Aug. 10, 1875:—

"This Coal possesses remarkable qualities as a gas and coking coal, and appears SECOND TO NONE IN THE KINGDOM. It contains the large quantity of 699 lbs. of illuminating matter, and 1498 lbs. of coke to the ton, and produces **12,240** cubic feet of 16·66 candle gas."

The above Company are raising nearly a thousand tons of the Real Old Silkstone Gas Coal per working day.

PRICES QUOTED TO ANY RAILWAY STATION, OR F.O.B. HULL, GRIMSBY, GOOLE, KEADBY, LIVERPOOL, AND FLEETWOOD.

WEST'S GAS IMPROVEMENT COMPANY,

LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

MANUFACTURERS OF

IMPROVED CENTRE-VALVES,

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

1862.

PATENT ANTIMONY PAINT.

MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

CLASS II.

This Paint having been in general use over fifteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

The following Gas Companies in London have used the Paint for years—viz., The Gaslight and Coke, Imperial, Independent, City of London, Commercial, London, and Surrey Consumers.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

The various descriptions of Gas Coal produced from the above Collieries possess an unequalled reputation, combining in a large degree the constituents essential for the production of the best quality of Coke and Gas of a high illuminating power.

A recent extensive development of the Collieries enables us to offer increased supplies.

JAS. PATERSON, Esq., of Warrington, after testing various qualities of our Coal, has sent the following testimony of their merits:—

Warrington Gaslight and Coke Company,
Offices, Mersey Street, Warrington, April 23, 1877.

Messrs. NEWTON, CHAMBERS, AND CO.,

Gentlemen,

After carefully testing the various samples of Gas Coals sent from your Collieries for analysis, I have pleasure in reporting them as belonging to the highest class of Gas and Coking Coals.

The average of Nine samples gives a yield of 12,500 cubic feet of 15½ Candle Gas, being equivalent to 664 lbs. of sperm per ton, and 1420 lbs. of fixed carbon of a very superior quality. All the samples bear a close relation to each other in value.

Yours truly,

JAMES PATERSON.

Full particulars will be sent on application to us—address as above.

NEW PATENT WET GAS-METER,
THE "RELIANCE,"
MANUFACTURED BY THE
GAS-METER COMPANY, LIMITED,
238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,
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HARRIS & PEARSON,
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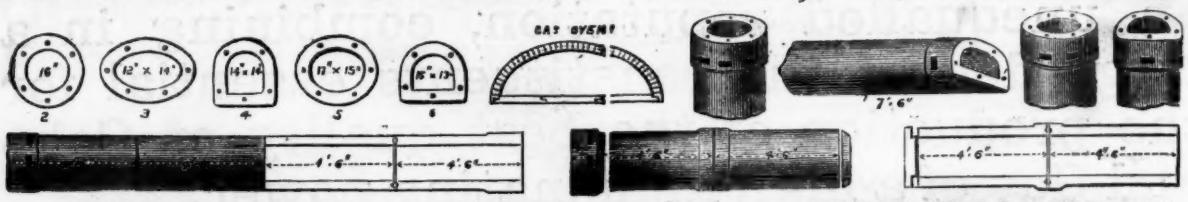

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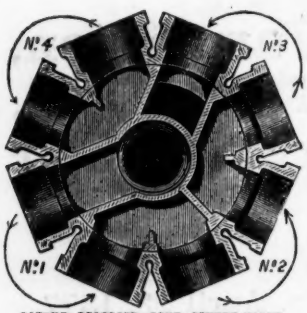

PATENT RECESSED CONE CENTRE-VALVE.
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SOLE MAKERS OF
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RECESSED CONE CENTRE-VALVES,
Constructed on the principle of the ordinary Plug-Cock.
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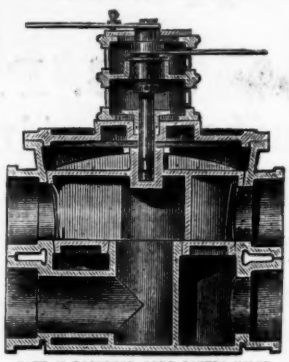
PATENT RECESSED CONE CENTRE-VALVE.
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Invite the attention of Gas Companies, Corporations, and others to their
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Which are so constructed that neither putty nor other materials are required to secure the glass. No hacking out of old putty, which frequently destroys the frames. A new pane of glass can be inserted in two or three minutes by any inexperienced person, the glass being secured by a hinged flap and turn button.

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For inserting in mains, to prevent the excess of pressure in high ground, or other elevated positions.

PATENTEES OF IMPROVED WET AND DRY GAS-METERS.
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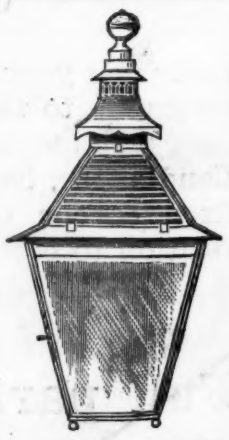

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